Writing Your First Paper

1. Caveats

This document is meant to provide a framework (i.e. a starting point) for your first paper. As you gain writing experience, you will probably need and/or take more sophisticated directions with your papers; however, this document is meant to address some of the common questions that arise as students make their first attempt to publish the results of their research. This document is not intended as a framework for graduate career milestone documents (e.g. quals, masters, etc.). These types of documents have purposes separate from those of a research paper.

2. Philosophy of a Paper

The success of research in the sciences relies on a competitive and argumentative atmosphere. The purpose behind this confrontational approach is to reduce the amount of shoddy research that gets published. Flawed research is less likely to be published with fellow researchers looking over your shoulder, ready to point out any mistake. Thus, in order to publish successfully, it is often useful to think of a technical manuscript as an argument with someone who doubts everything you say. This means that every statement must be well-accepted by the research community, backed up with a convincing argument, or backed up with a peer-reviewed reference.

Your peers are entrusted with assessing your research for validity and utility, and both are of equal importance. How you write your document will establish whether the reviewers (your peers) are convinced of either.

3. Paper Structure

Different research areas (cochlear implants, landmines, etc.) have different standard paper structures. Different types of research (theory vs. application) will also have different structures. These nuances should be observed by you over the course of reading the literature for your own research. This document is only intended to address commonalities between all these types of papers.

A typical paper structure will begin with an abstract followed by an introduction. The middle section of the paper may then take many different forms, but typically, a paper will conclude with a results section followed by a discussion section. There are variations on this theme that you may have to follow depending specifically on your research, but these sections are almost always included in a paper, so this document will address common questions about these four sections.
4. What is an abstract?

The purpose of an abstract is to help researchers decide whether to spend time reading the rest of your paper. As such, it requires at least three elements: a description of the specific problem you address, a description of how you addressed it, and the results/conclusions of your research. These should include just enough detail to allow a fellow researcher to determine if the problem you address, the approach you took, or your conclusions have any connection (are of interest) to their research.

Although we encourage heavy citation in your documents, references should be kept to a minimum in an abstract. This is not the time to defend your statements – save that for the introduction. References are usually reserved for special cases in which one of your three sections (problem, method, conclusion) is directly related to a specific study.

Abstracts also typically have a length and/or structure specified by the institution to whom you plan on submitting your paper. You will need to follow directions on how to formulate your abstract to conform to the publisher’s rules.

5. Introduction

5.1 Difference between an Introduction and Background

The main differences between an introduction and a background are the intended audience and the purpose. A background section assumes an audience with no knowledge of your research area, let alone your specific research topic. You must supply all the knowledge necessary to help them understand the global problem in addition to the specific problem that you address. This usually requires an extensive literature review, perhaps even referencing the researchers that initiated your field of study. An introduction, on the other hand, is much more focused. It assumes that the audience is familiar enough with the topic to know the global problem, and with some explanation, understand the specific problem addressed by your research.

The introduction’s purpose is to provide an argument in favor of doing your work, in other words, convince researchers of the utility of your work. A background doesn’t make an argument in favor of the research, but simply provides all the information that could possibly be necessary to make that argument.

5.2 Structure – Getting Started

Although there are many styles for introductions, the method presented here should be easy to master and is common enough to be considered fairly standard. The purpose of your introduction is to convince the audience of the utility of your work. Consider your introduction the presentation of a path that leads the audience from the global problem to the specific problem addressed by your research, convincing them along the way that your approach was valid and your topic is timely and of interest.
(even more preferable if possible, convince them that your approach was the only feasible one).

A typical path might look like:
- State global problem
- Narrow focus through argument and references
- State specific problem
- Discuss how it has been addressed in the past, and what is missing/needs to be done
- Describe how your work fills in that gap or furthers that work
- Specifically state what was done

When writing up your path, a method that may help you to determine whether you have got a path that is both connected and straight (no digressions) is to write down the theme of each paragraph. You can use this idea before writing in order to create your path, or use it after writing in order to evaluate your structure. Each paragraph should lead naturally to the next paragraph.

5.3 Examples

Here are some examples of paths from published works where each paragraph, more or less, represents one thought that leads clearly to the next paragraph. The paths are demonstrated below.

From “Performance Bounds and a Parameter Transformation for Decay Rate Estimation” – Tantum and Collins, 2003
- Many physical processes are modeled as the sum of decaying exponentials
- Many estimation techniques for determining the decay rates rely on uniformly sampled data; however, these techniques do not apply to non-linear sampling which may be more appropriate for exponentials.
- Rather than trying to improve decay rate estimation techniques, as has been done in the literature, and must necessarily be tied to the specific technique; this study proposes a parameter transformation that provides improvements regardless of the estimation technique.
- The Cramer-Rao lower bound is extended from previous derivations to provide a method of evaluating the possible improvements from the parameter transformation.
- Caveat: the goal of this work is to demonstrate a method for improving decay rate estimation, not to determine the number of decay rates present.
- Specific statement of work.

From “Investigation of the effects of temporal and spatial interactions on speech-recognition skills in cochlear-implant subjects” – Throckmorton and Collins, 1999
- The assumption by speech processors of channel independence with regard to subjects’ perceptual responses to electrical stimuli may result in poor transfer of information.
Channel interactions, as measured, may be considered to be spectral-based, temporal-based, or both.

Using many different methods, researchers have demonstrated that interactions occur and have suggested several methods, including sequential stimulation, for reducing interactions.

However, as forward masking demonstrates, interactions still occur, and the forward masking patterns may be indicative of possible stimulation problems.

These patterns may also be indicative of reduced speech recognition, either through reduced spectral resolution or temporal interactions. Both hypotheses are investigated.

Unlike previous studies, forward masking is measured across the array and for subjects with a large range of speech recognition skills, making it possible to investigate the relationship between forward masking effects and speech recognition ability.

Specific statement of work.

The key is to get the structure developed soundly. Writing style is much easier to correct than random, undirected structure. Those in the lab that will be helping you with editing will be better able to do so if they can see what you intended to convey. Also, don’t hold yourself rigidly to this structure if it means that key elements will be left out. This is a framework upon which to build your full introduction.

5.4 How to Handle References

References in the introduction basically are your proofs. How much and what you say about them depends on what you need them to say about your ideas. There are basically two types of references, what we’ll call “example” references and “proof” references.

Example references are used to back up generic statements in your paper. For example, “channel interactions have been observed in cochlear implants” or “EMI sensors have been used to locate UXO”. These types of references often occur in lists, and no details about the specific work other than those in the generic statement are offered. They are, as the name suggests, just examples. A note about these types of references – it is not okay to say something like the above and then just list one or two references you happen to have found or like. If you are making a statement about a broad body of research, you need to either make the effort to list all the papers that are applicable, or you need to list the most important papers preceded by an “e.g.” Keep in mind that your paper is going to be reviewed by people in this area of research – they won’t be pleased if the utility of their work is called into question by being excluded from your work.

Proof references serve a greater purpose. They are the references used to highlight certain issues, demonstrate the state of your area of research so far, validate your approach, etc. It is important to keep in mind while using these references the
purpose you intend for them. You need to describe details about their work as it pertains to your path, but you also need to avoid extraneous details.

5.4.1 Example Reference Examples

- “Several different techniques to remedy the high false alarm rates inherent to energy-based EMI sensor landmine detection via feature or signal-library based processing of EMI responses have been considered [3]-[14].”
- “Since these targets are buried, they represent minimal danger to sensors situated above the surface (after any existing surface UXO are cleared), and therefore such surface-based sensors as magnetometers and electromagnetic induction (EMI) are of significant interest for the UXO problem [1]-[5].”
- “In less than ideal conditions, the increase in the number of channels required to achieve maximum performance in speech recognition has also been noted, e.g. speech in noise (Dorman et al., 1998; Friesen et al., 2001; Fu et al., 1998), poor intensity resolution (Loizou et al., 2000), and degraded spectral information (Baskent and Shannon, 2003; Fu and Shannon, 1999).”
- “Although phase locking occurs for both acoustic and electrical stimulation, the discharge patterns differ considerably since electrical stimulation produces a highly synchronous response (e.g. Hartmann et al., 1984; Kiang and Moxon, 1972).”

5.4.1 Proof Reference Examples

From “Investigation of the effects of temporal and spatial interactions on speech-recognition skills in cochlear-implant subjects” – Throckmorton and Collins, 1999

By varying masker level, masker-probe delay, and probe location for a basal-, apical-, and centrally located masker, Chatterjee and Shannon (1998) noted a possible connection between poorer speech recognition and greater susceptibility to changes in forward-masking parameters. In the present study, data on seven subjects representing a wide range of speech-recognition skills were gathered; thus, it was possible to examine the correlation between speech recognition and forward masking, a topic which has not previously been explored in a rigorous fashion.”

Details from the reference are given for two reasons: to demonstrate that several different measures of forward masking effects have indicated the possibility of a connection between forward masking and speech recognition, and to demonstrate that the authors would be taking a more extensive approach towards investigating that possibility. With extraneous details, this paragraph’s arguments become much less clear:

Chatterjee and Shannon (1998) investigated the effects of masker level, masker-probe delay, and probe location for a basal-, apical-, and centrally located masker on probe threshold levels. Masker level was found to increase probe thresholds by a multiplicative factor. Similarly, probe delay had a multiplicative effect on probe thresholds. Probe location had little effect on the shape of the recovery function when the probe and masker stimulated the same electrode, but the shape did change when the probe and masker were on different electrodes. One of their three subject’s results appeared to be more susceptible to forward masking effects,
and this subject also had much poorer speech recognition. Thus, it was hypothesized that forward masking might be related to speech perception. In the present study, data on seven subjects representing a wide range of speech-recognition skills were gathered; thus, it was possible to examine the correlation between speech recognition and forward masking, a topic which has not previously been explored in a rigorous fashion.


“Previous results with energy-based pre-screener and feature-based classification algorithms using the NIITEK radar have indicated robust performance for detection of anti-tank landmines in government sponsored blind test scenarios [15], [16]. These tests were conducted over well-maintained roadbed simulators under a wide range of different weather and soil conditions. Based on these results, we have begun considering application of GPR phenomenology to more heterogeneous conditions typical of un-maintained but heavily trafficked roads. The roads currently being considered contain diverse naturally occurring GPR scatterers as well as occasional anthropic clutter items. Due to larger populations of discrete non-landmine subsurface GPR scatterers, false alarm rates for energy-based pre-screening algorithms operating under these road conditions are substantially worse than on the test lanes discussed previously [15], [16]. This performance degradation has motivated the application of feature-based postprocessing of data from pre-screener generated alarms to improve PD/FAR (probability of detection false alarm rate) performance for anti-tank landmine detection.”

Details are provided to indicate that pre-screeners and feature-based classification are a good idea with the NIITEK radar, and that the results from previous studies have been based on simulated sites rather than field data. This sets up the authors’ arguments that they should still be using pre-screeners and feature-based classification, but that now they must develop algorithms that function in more difficult scenarios. A brief example of extraneous details:

Previous results with energy-based pre-screener and feature-based classification algorithms using the NIITEK radar have indicated robust performance for detection of anti-tank landmines in government sponsored blind test scenarios [15], [16]. The NIITEK radar spans approximately 1.2 meters cross-track, consisting of 24 separate antennae. It is a very wide-bandwidth radar with extremely low radar cross section. The tests with the NIITEK radar were conducted over well-maintained roadbed simulators under a wide range of different weather and soil conditions…

6. Results

This is the section where you set up your conclusions – those final 1-2 sentences at the end of your abstract. Every plot or table should have some text devoted to it (even if it is just to say “here’s an example of what I’m talking about”). As a general rule, devote at least one paragraph to each major result. The basic structure of each of these paragraphs should follow something along the lines of:
6.1 Examples


The FEM study in the previous section provided a well-controlled setting for investigating the EMI modeling framework outlined in Section II. We now consider this model in the context of a measured GEM-3, for an actual ordnance... In Fig. 5, we present measured data (points) and the EMI fit based on the model in (4) and (5), for sensor angles of observation 0°, 90°, 180°… The results in Figs. 5 and 6 also demonstrate the generally strong aspect dependence to the frequency-domain EMI signatures of actual ordnance. However, it is important to emphasize that although the results in Figs. 5 and 6 show significant variation with orientation, each example is characterized by the same magnetization tensor…”


“Table IV provides comparisons of different TFCM feature extraction algorithms to pre-screener performance on all of the available off-lane data collections. In this table, each TFCM approach is scored based on the net percent change in area under the PD/FAR curve (AUC) generated by an RVM trained on the TFCM features compared to the area under the PD/FAR curves from our pre-screening algorithm. These AUCs are calculated over false alarm rates from 0 through 0.02 false alarms per meter squared (essentially the range of acceptable false alarm rates for the government sponsor). In this chart we note that over all data collections, the 3-D texture feature coding method provides the most robust performance increases compared to our pre-screening algorithm.”

From “Acoustic model investigation of a multiple carrier frequency algorithm for encoding fine frequency structure: Implications for a cochlear implants” – Throckmorton, Kucukoglu, Remus, and Collins, 2006

Although deterioration of frequency information is visible in the spectrogram for MCFA-2, it is still capable, with just two frequencies per channel, of providing the frequency transition information. Fig. 3 demonstrates that this frequency transition information can also be retained by doubling the number of channels; however, this option may be unrealistic in implant patients who have already been
implanted. The spectrograms suggest that a small increase in the encoded frequency information may retain spectral cues which would otherwise be preserved only through a large number of channels.”

7. Discussion

In some ways, a discussion is easier to write than an introduction (you know what you want to say about your research), but it is harder than an introduction to write well. It has multiple purposes rather than the single purpose of an introduction, but it still must have a path, i.e. each idea must flow naturally into the next, leading eventually to your final conclusions about your research. Here again, it is useful to consider the purpose of each paragraph and how that relates to the preceding and subsequent paragraphs.

In the discussion section, you will address the validity and utility of your work. The discussion section is the place to:

- Address any inconsistencies in the results (validity)
- Place results in the context of the literature (validity and utility)
- Consolidate results’ summaries into final take-home message (utility)
- Discuss caveats (validity and utility)
- Discuss future work that might address inconsistencies, caveats, or make this research even more meaningful/useful (validity and utility)

How you wish to order these topics is up to you, but to give the paper strength, the final paragraph should either be the take-home message or a reminder thereof.

References in the discussion are similar to those in an introduction, except that most of your references are likely to be argument references. The more controversial your paper, the more references you are likely to have in the Discussion.

An example from the discussion section of “Acoustic model investigation of a multiple carrier frequency algorithm for encoding fine frequency structure: Implications for a cochlear implant” – Throckmorton, Kucukoglu, Remus, and Collins, 2006:

“Another issue that will require further investigation is the perceptual overlap across channels that may occur with a multirate algorithm. At best, perceptual overlap might negate the possible benefits of a multirate system, but at worst, perceptual overlap might create psychophysical anomalies, such as pitch reversals, that have been suggested as factors capable of significantly degrading speech recognition (Throckmorton and Collins, 2002). Recent studies of the effect on pitch of varying pulse rates, compared across electrodes, suggest that a significant amount of pitch overlap may occur (Fearn and Wolfe, 2000; Zeng, 2002). However, these studies used pitch scaling tasks to determine pitch overlap, which may not be an adequate measure. In testing pitch scaling across electrodes stimulated under identical conditions, Collins et al. (1997) observed a standard deviation of 10% of the scale, suggesting an inherent difficulty in accurate scaling of pitch. Further, for Zeng (2002), three out of four subjects
estimated the pitches of the lowest pulse rate presented on an apical and a basal electrode to be equal, thereby using almost the entire scale (0 to 100) for both electrodes. These results seem to suggest that, at least in part, subjects may have split the pitch scaling task into two tasks, estimating pitch for each electrode separately.”

8. Revisions

8.1 Types of Journal Responses

You’ve submitted your paper – now what? Depending on the journal, you will probably be waiting at least six weeks, maybe six months to get a response from the editor letting you know how your paper was received. There are four typical responses: accept without revisions, accept with minor revisions, accept with major revisions, and rejection. Having a paper accepted without revisions or with only minor revisions is quite unusual. If you experience this rare event, feel free to be quite pleased. Remember – journal publishing is a confrontational paradigm, and your reviewers are actively searching for flaws. Minor revisions are typically suggestions on sentence wording, adding a reference or two, or fixing grammar. All of the suggested changes should be applied.

Rejections are a bit more common, and they do not necessarily reflect that your work is not publishable under any circumstance. A paper may be rejected on validity or utility grounds and still be publishable with some revisions on your part. For example, a paper may be rejected because the reviewers felt that it was not a good fit for that particular journal (utility). A paper may be rejected because some additional work is needed, or some controversial work should be deleted (validity). Unless the reviewers have found an unsalvageable flaw in your methodology (i.e. there is no validity or utility in your work), then you should try again to get your work published. Even though you will be resubmitting your manuscript to a different journal, you should not proceed as if the first set of reviews never took place. You should take into consideration the criticisms that you have received and make changes where necessary. It is not unheard of for a different journal to send your manuscript to one of the same reviewers who rejected your manuscript previously. They will still have the same reasons for rejecting it anew if you have not taken their comments into account (and will probably be more vehement about it).

The most common response is “accept with major revisions.” These suggested revisions can be quite extensive, including changes to your manuscript’s structure, changes to your conclusions drawn from your results, requests for different/more comprehensive analysis, or more extensive discussions of your work in the context of the literature. They will also likely include fairly minor changes such as sentence wording. Putting emotion aside (you will likely feel some frustration), making changes to accommodate reviewers almost always leads to a better manuscript. Thus, wherever possible, reviewers’ suggestions should be followed. There will, on occasion, be suggestions that you feel will detract from your manuscript. Discuss
your feelings with at least the appropriate Senior/Research faculty, but also get input from your fellow students if appropriate. Disregarding reviewer comments is not something to be taken lightly. If all parties agree that those reviewer comment(s) should not be implemented, then you may ignore them.

### 8.2 Response to the Reviewers

#### 8.2.1 You made the changes

You’ve made all those changes suggested by the reviewers – what’s next? In the case of “accept with major revisions,” and possibly in the case of “accept with minor revisions,” you will need to prepare a separate document that is a response to the reviewers’ comments. There is no definitive format for the response, but there are three things that you should indicate for each comment:

- What did the reviewer say originally?
- What did you do in response?
- Where did the changes take place?

There are several ways to indicate the first bullet. Some people in the lab always quote the reviewer verbatim. Others quote short statements and paraphrase long ones. Your goal is to remind the reviewers of the comment to which you are responding. Be careful with paraphrasing – the goal is to shorten the reviewer comments to the key points. Avoid communicating your frustration through the phrasing you choose.

Assuming that some change took place, you want to give some indication of its location in the new manuscript, e.g. page number, paragraph, lines, section number, etc. There are also several ways to indicate the changes that you carried out in response to the reviewer’s suggestion. Some people in the lab simply state what changes were made, others quote the changed text verbatim. Again, these choices are up to you, and you can choose one method or a mixture of them.

**Example:**

2. “p. 11, first paragraph. The argument that multiple measurements take (too much) time has never been an appropriate excuse in any domain of science.”

**Response:** (p. 11, para 1). The authors did not intend to imply that they did not make repetitions of the measurements due to the amount of time necessary to gather them. Rather, based on the number of hours subjects were willing to participate in the experiment, the authors were forced to gather only single measurements in order to achieve the goals of the study. To rectify this misunderstanding, the first paragraph on page 11 has been re-written. The paragraph still discusses possible ramifications of using single measurements rather than averaged measurements.

Note – even though the reviewer misunderstood what the authors were attempting to communicate, and even though this was more a comment than suggestion, the authors nevertheless made changes based upon it, thus improving the manuscript and appeasing the reviewer.
8.2.2 You didn’t make the changes

If you have not made a change despite a reviewer’s suggestion, you will still need to respond. This is where you will need to tread lightly. It is important to convince all the reviewers and the editor that you did not ignore this suggestion without serious contemplation, and that you made the right decision. It is sometimes helpful to point out where you agree with the reviewer before beginning your argument.

Example:

“9. Figures. Consider organizing the figures by tasks so that the readers can appreciate the individual variability which seems to be the main point in the paper.”

While combining results by task may demonstrate the pitch structure variability between subjects, this grouping reduces the ability to get a clear picture of each user’s complete pitch structure due to the addition of a second rate. Because the two-rate task was broken down into three subsets of stimuli, there is no accurate way of representing a single subject’s entire two-rate pitch structure in a single plot. For this reason, results remain grouped by subject; however, all single-rate results are now plotted in Figure 6 to demonstrate variability between subjects.

8.2.3 Fundamentally Flawed

There will at times be reviewer comments that call into question the validity or utility of your work in general, often with no particular suggestions on how to overcome these issues. Phrases like “the entire framework is fundamentally flawed” and “this manuscript deceives the research community” will give you an indication that the comment falls into this category. Assuming you do not agree, you will need to argue convincingly that the reviewer is wrong. Your arguments are really aimed at the other reviewers and the editor who will ultimately decide if you are correct and your paper can be published as is. Thus, it is important to avoid alienating anyone else. The good news is that the editor is probably already somewhat on your side, or your paper would most likely have been rejected outright.

Example:

1. General Comments:

“… it seems that it would not be difficult to implement one or more of the novel processing algorithms for experimental use by subjects with cochlear implants. Given that presently there are in the order of 100,000 users of implants, and that the signal processing as described is not particularly complex or even a great departure from existing speech-processing strategies, I would strongly urge the authors to conduct a study with implant users to test whether any of the anticipated benefits can possibly be achieved in reality. … It would seem worthwhile for the authors to carry out at least some of those [psychophysical] studies before coming overly optimistic about the potential of their novel processing schemes.”
Response: (p. 3, second paragraph; p. 17, lines 7-13; p. 17, last two lines; p. 18, first two lines; p. 25, second paragraph, lines 9-16; p. 26, first paragraph). While the authors agree that the signal processing of the novel algorithms is not particularly complex (hence the appeal of implementing such algorithms), they must respectfully disagree with the reviewer regarding the ease of implementation. While current algorithms allow for different pulse rates, once the pulse rate is set, it must remain the same across all electrodes for the duration of the stimulation. The proposed algorithms are a major departure by proposing the variation of pulse rate across electrode and within stimulation. Standard programming interfaces cannot be used for this purpose, and the authors are currently working with the SPEAR 3 (an Assembly-language programmed device) to be able to design algorithms that have this freedom to change pulse rate. Variable pulse rates will also lead to other implementation complexities (e.g. how to time pulses of different rates) in addition to the many caveats listed in the conclusion section.

While the authors agree that many psychophysical experiments will be necessary to determine whether the use of pulse rates is even feasible for the purpose of providing increased frequency resolution within channel, this paper presents the first step which is to determine whether this level of experimentation shows some indication of being worth pursuing. However, the authors do acknowledge that some sentences appear to be overly enthusiastic, blurring the line between acoustic model results and implant results, and these statements have been edited to indicate a more cautious outlook. Further, the authors have also added to the Introduction a warning to the readers as to how acoustic model results should be interpreted.

Some Last Words of Advice:

Plagiarism:
By now, you have seen the plagiarism section in the lab manual, and this being your first paper, you are probably a little nervous about making sure you follow the rules. At the same time, the lack of practice with writing can leave you asking questions like, “Can I use other papers to tell me what information goes where?” and “How do I uniquely rewrite something that has been written a billion times before?”

For example, implant papers require a methods section, but you’ve never written one. You don’t know what goes in one, and you don’t want to plagiarize! But it is hard to figure out what information to use in a methods section without looking at what other people included, and it is hard to relay similar information without using the same phrasing. Here’s a method for approaching this problem. Select two or three papers (not review papers) that have been influential to your research. Make an outline of the types of information that they include in the section of interest. Consolidate the information into a list of things that you should include (similar to using the ‘unique’ command in Matlab). Then wait a week or two before writing, but when the time comes, pull out that list, do not refer to any specific paper.

The odds of using the exact same phrasing as these other papers should be greatly reduced by using this method, but there are only just so many ways to say “biphasic pulses with phase duration of X.” Using the standard terminology is not plagiarism.
You don’t need to come up with a unique way of saying “biphasic” and in fact, doing so may make your paper incomprehensible.

Example:

Paper A Methods Section
1. Subjects
   1.1 Device Used
   1.2 Experience
   1.3 Demographic Information
   1.4 Speech recognition scores

2. Stimuli
   2.1 Pulse shape
   2.2 Pulse rate
   2.3 Phase duration
   2.4 Pulse train duration
   2.5 Mode of stimulation

3. Experiment specific stimuli

Paper B Methods Section
1. Subjects
   1.1 Number and gender
   1.2 Device
   1.3 Demographic information
   1.4 Experience with device
   1.5 Mode of stimulation

2. Stimuli
   2.1 Pulse shape
   2.2 Phase duration
   2.3 Pulse rate

3. Interface
   3.1 Specialized equipment
   3.2 Computer
   3.3 I/O device
   3.4 Feedback

4. Experiment Descriptions

Paper C Methods Section
1. Subjects
   1.1 Number
   1.2 Devices
   1.3 Demographic information
   1.4 Experience
   1.5 Mode of stimulation
   1.6 Dynamic ranges
   1.7 Experience
   1.8 Test session descriptions and compensation

2. Equipment
2.1 Testing paradigm  
2.2 Computer  
2.3 Feedback  

3. Stimuli  
3.1 Pulse rate  
3.2 Pulse train duration  
3.3 Experiment design  

4. Experiment procedure  

Now this information can be consolidated into a list of information that applies to your particular paper. With an outline as vague as this, you are unlikely to find yourself replicating other papers, especially if you wait a few weeks before writing.  

**Tone:**  
Although this is hinted at throughout this document, it is important to keep in mind the tone you are creating through your writing. As mentioned in the Philosophy of a Paper section, your statements must be defendable. This often means being cautious about how you phrase your statements. Rarely are phrases such as “obviously,” “clearly,” or any variant of “everyone knows/can see” a good idea. You should not make assumptions about what is clear, obvious, or known to any of the readers since they might well resent it. It is also a good idea to hedge your conclusions where you think they indicate one thing but it could be argued that they do no such thing. Reviewers do not hesitate to point out when they think you are being overly optimistic (see example in section 8.2.3). Get your point across in the conclusions, but be restrained.  

**Validity versus Utility:**  
Validity is an assessment of your methods of conducting research while utility is an assessment of the reasons for conducting your research. You have likely been taught to have a healthy respect for choosing valid methods by now. All of your coursework (“show your work!”) and lab reports have focused on this very point. You are evaluated based on the validity of your approach and application of said approach. Validity is still an important issue now – if you do not have a valid methodology, you do not have publishable results. However, publishing research now introduces a second goal beyond that of validity. Even if your approach and application are completely valid, you can still produce research that is unlikely to get published. Reviewers need to see the utility of your work in addition to the validity. For example, if you simply replicate something that has already been done (and published), reviewers will find little reason to publish your work as well. Publishing a work that says, “Hey, yeah, I saw the same thing!” provides little advancement of your field of research which is ultimately the goal of all publishing.  

Similarly, if you carry out a completely valid study that is also completely unique, but no reason is provided for conducting that research, the reviewers may well fail to see a reason for publishing it. Do not assume that the reviewers can see the reason for
your work without being explicitly told. The confrontational approach to publishing makes reviewers disinclined to try to figure out that which you have neglected to tell them.

The bottom line is that you need to communicate why your work advances your area of research. This does not require you to inflate your results, but you do need to demonstrate some convincing reason for why your work should be published. Keep this in mind as you write your paper, and don’t hesitate to remind readers throughout the document about what you think is important about your work.

**Close:**
Hopefully this document has you well on your way to publishing your first paper. Suggestions for revisions of this document are welcome.