The research proposal is a vital part of your thesis project, both at the undergraduate and graduate levels. Your typical work days are busy with lots of distraction and it is easy to lose focus your ultimate thesis goals. The proposal is your guiding light to help you plan and execute an outstanding research project. You should revisit it at least once a year, or more as new data are collected and analyzed.

If you are a Biol 537 student, this may be your first attempt to write a research proposal, so a bit of advice: **Be prepared**! This is not something you can sit down and start writing within a week or two. In fact, little time will be spent writing, most of your time will be spent reading brainstorming, planning and revising, rather than writing. The more time you give yourself for revising and editing, the better your proposal will be. As a starting point, carefully read the proposal assignment instructions on the 537 page -- this is useful even if you are a graduate student preparing your first proposal for a committee meeting.  
<http://post.queensu.ca/~biol537/>

Here are a few additional tips based on past experience working with students.

**1. Identify Your Questions (or Hypotheses)**

This is the most crucial step and you should work this out with your supervisor as soon as possible. Initially you may only have a vague idea of your topic and what your questions might be. They are not set in stone, but still try to make them as concrete and tractable as you can. Keep them in mind as you move on to step 2.

**2. READ, READ, READ**

Use databases like [Google Scholar](https://scholar.google.ca/), [PubMed](https://www.ncbi.nlm.nih.gov/pubmed), and [Web of Science](https://webofknowledge.com/) to identify all of the studies that are relevant to your research interests. Don't get caught up on your study organism initially. At this point you should cast a broad net look for broad conceptual similarities, rather than papers with similar methods or study organism. Find a few key papers (e.g. high citations or published in a top journal) and figure out what common keywords you can use to narrow your search. Save all relevant references with abstracts. Quickly read through the abstract list and prioritize your reading so that you start with the papers that are most relevant to your project and of those start with papers that are published in top journals like Science, Nature, Proceedings (Royal Society and National Academy), Evolution and Ecology. If you don't have any in those journals, there is a good chance you were not looking broad enough in your search.

After identifying the key papers, read through each paper and make file to keep your notes: What are the main questions they are posing in the introduction? What do they identify as important future work or open questions in the discussion? Include your answers to these questions in your notes. As you continue to read you should also keep notes on the specific methods used, either in the same file or a separate file for notes on methods. Periodically review your notes and make a new document comparing the different studies. What are their key similarities and differences? Are there areas of controversy.

You will probably need to **spend at least 25-50 hours** on this, though it could be considerably more if this is a new area of research for you. Even after you finish your proposal, you should schedule 5-10 hours per week to continue your reading and note-taking throughout the semester. **By the time you sit down to start writing your proposal, you should have a good idea of all of the main points you want to include**. If you don't know what to include, there is a good chance you have not done enough reading!

**3. Know Your Audience**

Science writing is quite different from other forms of prose or creative writing. Your number one goal is to effectively communicate clear and concise ideas with your audience. **Clarity is your number one priority**: getting the reader into your headspace using a common set of terms and phrases. **Being concise is your second priority**: don't use five words when two are sufficient. When proofreading, read each sentence very carefully and ask yourself if the meaning is crystal clear or if there is a more concise way to say the same thing. Elegant phrasing and a flowing narrative can add a nice touch but always take a backseat to clarity. The specifics of how you do this will depend on your audience. For a 537 proposal for example, you want to avoid using too much jargon or assuming detailed knowledge of a particular theory or hypothesis.

**4. Start Early**

Assuming you have already spent a good deal of time reading and making notes on the background literature, a very common mistake when starting to write your proposal (or any scientific document really) is to just sit down and start writing from the first sentence. This often happens when a student has waited to long before starting their proposal and now has to try to quickly write something. This is bad practice! **Good science writing comes from well-formed ideas and carefully constructed paragraphs and sentences**. In my experience, good writers actually spend very little time writing. Something like 10% of their time actually writing. After the background reading, the majority of time is actually spent **brainstorming, planning, structuring, and editing** (and editing, and editing, and editing, and editing again). After reading, the next step is developing a scaffold for your writing.

**5. Plan Backward, Edit Forward**

Start with your research question(s) or hypotheses. These act like guiding principals for your thesis. **Everything you write, everything you measure, everything you analyze should revolve around these central questions**. They are not set in stone and may change as you continue to read and develop your understanding of the topic. Or you might discover something in your data that suggests a new research direction. Nevertheless, you should have these worked out in pretty good detail before you start to write your proposal. Discuss with your supervisor to make sure these are crystal clear before you start laying out the framework for your proposal.

Once you have your questions, think carefully about everything the reader needs to know. Why are your questions important? What background knowledge does the reader need to know? What other research has been done already, and what is different about your study? What methods will you use to address these questions?

As you build your scaffold on top of these questions, it can help to work backwards from your main questions up to the 'big picture'.

**Start with a Skeleton**

A good habit is to begin by writing out all of the major points you want to make, and identify where they would best fit in the document. Think of it as a hierarchy:

* *What* ***sections*** *are needed (intro, discussion, etc.)?* Often this is already spelled out in a document like the 537 Research Proposal Instructions (see link above)
  + *Within each section, what will each* ***paragraph*** *cover?* Remember, a paragraph is a complete thought. At this stage, you should be able to define the main thought that each paragraph covers
    - *Within each paragraph, what will each* ***sentence*** *talk about?* Depending on your energy and inspiration level, you can either try to write out a first draft of the sentences, or simply write the main points. Don't waste time trying to find the perfect wording. You may not even end up keeping what you write

Here is a generic outline to the **level of paragraph** for the 537 proposal (based on instructions from 2016-2017). Some suggestions are provided for what might be included in each section, but this will vary somewhat depending on the project. As noted above, it often helps to write these in reverse, beginning with you specific research question(s) and working back towards the big picture:

**General Introduction: The Big Picture**

* Start big. Cast a wide net to bring as large an audience as possible. What are the main problems or big theoretical concepts that are involved in your work. Some common examples in our lab are:
  + Rapid evolution in human-altered environments
  + Impacts of invasive species
  + Short-term constraints on adaptive evolution
  + Genetic basis of adaptive traits
  + Maintenance of genetic diversity in nature
* You should have a pretty good list of these from your notes on the introductions of the papers you have read (see #1, above).

**Research Focus**

* What has been done before? Focus on the studies most relevant to your specific research questions.
* What is new and innovative about your study? Identify your research 'niche'

**Methodology**

* Don't go into detail, but use key words and phrases that show the reader there is a lot of thought behind what you have written. Name-drop specific methods (e.g. CTAB extraction, nested half-sib breeding design), technology (e.g. Illumina MiSeq, CAC High-Performance Cluster), software (e.g. STRUCTURE, R) and analyses (e.g. PCA, gls).

**Significance:**

* Upon completion of your thesis, what will you have contributed? Avoid absolutes like "we will know", "we will understand", and instead imply an important contribution to a bigger objective "will help clarify", "will better understand"...

**6. Start Writing**

Now that you have gone through steps 1-5 you can fill in your sentences. Organize your main points into a flow that makes sense. Choose your words carefully.  Make sure each paragraph has a topic sentence and a concluding sentence. Try to link the concluding sentence of one paragraph and the topic sentence of the next.

## 7. Proofread

Read through your document, looking for common errors and trying to improve the flow of the sentences and paragraphs. Again, check that each paragraph has a topic sentence and concluding sentence. Make sure the wording of each sentence is clear. Make sure the structure of your sentences and paragraphs make sense.

Read through multiple times, each time being more brutal about what to cut, but also allow for additional wording if it adds clarity. Look carefully at the structure of your sentences. If the meaning of any sentence isn't clear without having to re-read it, then it probably needs to be reorganized or broken into two or more sentences. Each time you proofread try to reduce the number of words you use without compromising the meaning or the clarity.

## 8. Repeat

These steps were written out in a general order but you should think of writing a proposal as an iterative process. The proposal will give you a baseline for reflecting on the papers that you read, and these in turn will help to clarify your thinking sometimes give you new ideas or a different perspective on your proposed research.