BIO700 – Skills for Success in Academia
Week 8: Finding grants and applying for them

FUNDING SOURCES

For eco-evo: http://www.des.ucdavis.edu/faculty/baskett/links/academia.html; http://www.indiana.edu/~halllab/GradGrantsOpps.htm

For cell bio: http://mamba.bio.uci.edu/~pjbryant/dbc/funding.htm

OSP: You can contact them with your research field, the kinds of funding you're looking for, and see if they have any sources they know of or if they can send information your way when it comes along.

Use the Google! It is your friend. When searching, include information on type of grant you're looking for (travel grant, postdoc, etc.) and your field (ecology, evolution, cell biology, development, genetics, genomics, etc.). Search a few variants and see if you get a different set of hits.

THE PROPOSAL

Before you get started, contact

- your office of sponsored research – here it's OSP, Trish Lowney would be a good first person to contact, let them know what you're applying for, check to see what information they need from you, if they need to approve the budget (if applicable), how far ahead of the deadline they need it, etc.
- whoever in the biology office deals with the grant application process (if anyone does) and make sure you coordinate with them, if necessary
- your project officer. This applies to NSF or NIH as well as with other funding sources. Run your ideas by them (make sure you've thought about them in sufficient detail) and make sure your application will be of interest to them. You can also seek advice on which panel (NSF) or institute (NIH) to send it to.

The general approach

- The point of the grant proposal is to convince the granting agency (by way of the reviewers) that
    - the study proposed is interesting and important
    - the study proposed is doable
    - the study proposed is doable *by you* (that is, you are capable, competent, and have sufficient knowledge in the field)
- In other words, your job is to convince them that their money will be well-spent.

Things that are considered by reviewers:

- For NIH: "Significance, Investigators, Innovation, Approach, Environment"
    - Significance: The proposed research should address an important problemthat will significantly advance scientific knowledge and or methodology.
    - Investigators: The PIs (e.g., you and your advisor) should be appropriately trained and well-suited to carry out the work. For example, you or your PI should have a publication

record in the field. If you are branching into something new, include another collaborator on the grant with the necessary experience, often accompanied by a letter of support.
    - Innovation: The project should be original and innovative. Innovative is somewhat hard to define, but it involves novelty and creativity. This can include applying novel methodology to an important question or applying existing methodology in a creative or new way.
    - Approach: The conceptual framework, design, methods, and analyses should be well-developed and appropriate to the aims of the project. Potential problem areas should be discussed and alternative approaches described. In other words, if a method is risky, have a Plan B.
    - Environment: The scientific environment should contribute to the probability of success. Point out any unique features of the scientific environment that benefit the studies, including collaborations. Describe available institutional support such as equipment, facilities, and personnel.
- For NSF: "Intellectual Merit, Broader Impacts"
    - Intellectual Merit: Proposal should advance scientific knowledge in a broadly applicable way; investigators should be well-qualified; proposal should explore creative, original or potentially *transformative* concepts; proposal should be well-conceived and well-organized; sufficient resources should be available.
    - Broader Impacts: These are activities (separate from proposed research) that promote teaching, training and learning and should ideally focus on underrepresented groups (incl. disability and geographic underrepresentation), can enhance infrastructure for disseminating research and education (e.g., websites). See **http://broaderimpacts.info/#**.
- The Institution – can the proposed work be done at the investigator's institution? Is infrastructure in place, or will you need to go somewhere else to find needed equipment?
- The Advisor (for grads or postdocs) – will the mentor be able to provide adequate advising and expertise? If not, is there someone else associated with the grant who can? This is usually verified with a letter of support from this person, usually a collaborator.
- On the whole, reviewers and panel members want to like your proposal. Your job is to make that as easy as possible for them to do.
- Try to anticipate reviewer criticisms (hard to do, I know), and address them directly. Better not to gamble on the possibility that they might not notice some weakness in your experimental design. Maybe a small experiment can be done and preliminary data presented to address an issue of feasibility, for example.

Come up with two or three questions that you will address.

- You may propose two or more experiments under each general question.
- Do not make experimental designs unncessarily complicated. If what you do is remotely confusing to you, it will be much more so for a reviewer. If the design is necessarily complicated (as they often are), make it clear exactly what you intend to do and why.
- These questions will become your Specific Aims.
- Do not allow the relevance of any specific aims to rely on the success of others. For example, don't propose to find the gene for leaf number and then propose to manipulate the gene to see if you can change leaf number. What if you don't find the gene?
- Don't propose too much. Less is more.

Come up with your hook.

- These questions need to come with a "hook" that justifies the questions and is the fundamental rationale for your proposal.
- In the ideal case it should represent the solution to an important problem, be attention-grabbing, easy to understand, and easy to remember.
- Place your proposed work in the context of some important problem. "The diet of *Sceloporus occidentalis* in eastern Benton County, Oregon has never been studied." This statement fails as a hook – even though it might be true – because only an extremely small audience of devotees will see this gap in our knowledge as an important problem. "Studies of lizard diet may be sensitive indicators of deleterious consequences of global climate change." This statement is closer to the mark, but of course the proposal must go on to defend this claim.
- Often the hook can be presented as a solution to a pressing, well known problem. In such cases the hook itself occurs as the second or third sentence in an opening paragraph. Sometimes the following construction can be used: an opening sentence states the ***problem***, the second sentence states an important ***limitation*** in ongoing solutions, the third sentence (the hook) presents the ***solution*** to that limitation.
    - "Widespread and deleterious ecological consequences are expected from global climate change. In many locations, however, we lack sensitive ecological gauges of these deleterious consequences. In the proposed work I will develop assays of lizard diet that can be broadly used to assess the consequences of climate change."

Read the literature and research what is already known about your questions.

- This can be done before you even settle on exactly what your questions are.
- In this way, you become familiar with the background and previous studies as well as tried and true methods.
- The literature search will help you plan your experiments and figure out your methods.
- You will also become familiar with the gaps of knowledge, what is missing from the field and so set up the justification for the proposal.
- In your research of the literature, develop the background for the questions, a description of what is missing, and the approach of how you supply it.
- Cite the literature throughout the proposal.

Preliminary data

- Doesn't always apply to grad student proposals, but can, as in the NSF DDIG
- May address any potential problems or weaknesses in the proposed questions.

Typical parts of an NSF or NIH grant:

- Summary (NSF)
    - NSF: Intellectual merit and Broader impacts sections
- Results from prior support (NSF)
    - This section demonstrates that the money they gave you last time was put to good use, that you were productive and were able to train a number of people.
- **Specific aims** (more NIH): Can be hypotheses that you will test.
- **Background and Significance**
    - A thorough but relevant review of the literature including any controversies, should provide evidence and justification for your proposed hypotheses and research plans.

Highlight potential impacts and broader applicability to other systems or important questions.

- **Preliminary results**
  - Doesn't always apply to grad student proposals, but can, as in the NSF DDIG
  - May address any potential problems or weaknesses in the proposed questions.
  - Can demonstrate feasibility of the proposed methods, as well as your competence as a scientist
  - Includes stats and figures
  - Should lead into your proposed experiments seamlessly.
- **Project description** (organization here varies)
  - Introduction, ends with Specific Aims
  - Proposed Research
    - Projects
      - Overview/Objectives
      - Methods/Analysis: shouldn't be a cookbook, but needs to thoroughly describe and justify the appropriateness of the methods
      - Preliminary data, if applicable
- **Timeline**
- Future directions
- **Broader Impacts**

Why proposals don't get funded

- The funding mechanism was not appropriate for the research proposed. (You sent it to the wrong place.)
- Insufficient expertise.
- System is not appropriate for the research proposed.
- Project description is too vague, fails to instill confidence that the PI has sufficient expertise and is competent to do the work.
- Rationale not well-developed.
- Methodology was inappropriate.
- Constraints or controversies were not appropriately discussed.
- Overly ambitious.
- Proposal not clear or incomplete.
- The feasibility of the proposal depended on the first aim or project.
- Projects lack significance or innovation.

Visual considerations

- Make judicious use of bolding, italics and underlining.
- Don't be afraid to summarize key points in italics, like "*Take-home message: Female reproductive tracts are complex and rapidly divergent; sperm form, which is also complex and rapidly divergent, tracks changes in female tract design.*"
- If you can spare the room, separate conceptual breaks by a space between lines, or even better, separate paragraphs. This can be done in a space-saving way by formatting spacing to be 12pts after the return.
- Avoid using a font size below 11 points. Sans serif fonts can save space and be easier on the eyes, but the latter is somewhat a matter of personal preference. If your font needs to be smaller,

sans serif is better visually. However, Times New Roman takes up less space than some other fonts. Play around and see what works.

Grammar and sentence structure

- Keep sentences to a length that will fit on 3 lines.
- Restrict the number of clauses to 2 per sentence. This practice avoids run-on sentences.
- Review clauses and the rules for comma placement.
- Avoid using "this" (and other demonstrative pronouns) as a noun. Rather, use it as an adjective. ("This result would demonstrate…" instead of "This would demonstrate…")
- Avoid repeating the same word in adjacent sentences, or 3 times in a paragraph. However, a word or phrase can be repeated for the sake of conceptual continuity.
- Don't start a sentence with an abbreviated genus name: "*D. melanogaster* is a useful model system for a number of reasons."
- In general, write out numbers one to ten, ten and above, use Arabic numerals (e.g., nine, ten, 11, 12).

RESOURCES

NIH has better online support for preparing and writing grants.

- General grant resource: http://www.niaid.nih.gov/researchfunding/grant/pages/aag.aspx
- Examples of good R01 proposals, including notes along the side pointing out specific things to notice: http://www.niaid.nih.gov/researchfunding/grant/Pages/appsamples.aspx
- http://grants.nih.gov/grants/grant_tips.htm
- Page with videos on grant review process, tips for applicants, and the application process: http://public.csr.nih.gov/aboutcsr/contactcsr/pages/contactorvisitcsrpages/nih-grant-review-process-youtube-videos.aspx
- Your program officer at NSF or NIH
- It's their job to assist you with the application process, and they want you to contact them.
- Best to touch base with them in the early stages to get feedback on the appropriateness of your proposal ideas for the funding mechanism and/or institute/division.
- Advice for writing a DDIG:
    - http://www.indiana.edu/~halllab/GradRes/Skelly_2003_BESA.pdf
    - http://www.indiana.edu/~halllab/GradRes/Hall&Moyle_DDIG_advice.PDF
-

Trish Lowney, Office of Sponsored Programs: osp.syr.edu

- Your grant will need to be approved by OSP.
- They can help identify appropriate funding mechanisms.
- They can help you with the budget and other administrative details.