Bio-BOOT CAMP, Advanced Topics 7964-1, Fall

Reading the Scientific Literature. Tom Kursar, kursar@biology.utah.edu, 1-8369

There are two assignments. Email those, plus the pdf, to me on or before the Thursday night before class.

Posted materials:
- How_to_read_a_paper
- Dickinson_1995
- Generating novel questions
- Faculty of 1000 Biology
- Materials from the internet

‘A. Read “How_to_read_a_paper” and be prepared to discuss in class.
‘B. Read “Dickinson_1995”. This is a lesson in thinking critically while reading. Be prepared to discuss in class.
‘C. Read “Generating novel questions”. Be prepared to discuss in class.
‘D. Read ‘Faculty of 1000 Biology’. This is for your information. If there is interest, we could discuss this in class.
‘E. Guidelines on reading the literature that I downloaded are posted as “Materials from the internet”). I have not reviewed these and these are not assigned.

Apply your observations from the above readings in parts F and G.
‘F. Choose and read one paper in an area of your interests that you have not read previously. Email the pdf to me before class. Write a commentary, a summary, a critique or anything similar. This should be at least a half-page or 400-words. Include any relevant observations from “How to Read a Paper” or “Generating novel questions”. Email that to me before class.
‘G. Write a one-sentence description or a title for two different (possible) topics for your PhD thesis and email those to me before class. We will discuss some or all of these in class, with a focus on brainstorming to identify and formulate the major issues represented by a thesis topic.

The following is a summary of suggestions from our Biology faculty on how to read the literature and organize your knowledge of the literature.

‘1. As a graduate student, you should read a lot:
   - for knowledge
   - repetition also develops skill
Read as if you are a reviewer, but with the goal of understanding the science. Although perhaps peripheral to the goals of this class, one might consider suggestions for greater impact, more clarity or improved writing (as one would in an actual review).

‘2. Reading in your thesis area:
Start by thinking about your question or area of interest without reference to the scientific literature (i.e., ‘brainstorming’). You may generate new ideas of your own. Although it may be pragmatic to start out by reading, learning what the experts think colors your vision and may stunt your intellectual growth. No matter what the outcome, even if you ‘rediscover the wheel’, the process of thinking through a problem builds your confidence.

Reading:
Start with a simple perspective, such as “What is known and what is not known?” What would you like to know? Which are better, your ideas or those in the literature?

Find [good] review papers or book chapters. These should:
- give you access to the best primary literature, data papers.
- be synthetic, provide clear guidance on where the field is and where (in the authors’ opinion) the field needs to go
- indicate the linkages with other areas of inquiry

Look at the literature cited. This may lead you to important papers that you would not access through search engines.
If you are unsure whether a particular paper is worth reading, read the abstract, figures and tables first.
Many journals will send you the table of contents of the current issue; sign up with the journals in your field.
In the case of papers that you must understand in depth, try rereading over two or three days.
You may find new insights on the second or third reading.

‘3. Non-thesis reading: research papers for classes, journal clubs, seminars. These provide new results, are narrowly focused, and refer to the big ideas but have limited space to do so.
‘3A. What is the big picture? …the big question? …the principal hypothesis???
‘3B. What does it say?
‘3C. Do you believe it?
The skills that take the longest to develop are associated with the first question.
You can read through the paper in order or jump around.

‘3A. The big picture:
What are intellectual and historical antecedents?
What are the most interesting or broader implications?
In what way is the paper most interesting?
Have they captured the important results or have they left important questions unanswered?
Is the question compelling?
Do they make a good case for the significance of the results?…or did you have to figure out why it is compelling OR does the paper lack anything compelling?
As has already been noted, read multiple times, perhaps on different days. This helps to develop a broad perspective.
Look at the dates of the citations, especially those that established the groundwork, to get a sense of the history. Consider that there may be some reinvention of the wheel and ‘collective forgetting’.

‘3B. What does it say?
Take notes as you go, write a 3-sentence summary of the topic and results of the paper after reading the abstract and hypotheses. After reading the paper, revise your summary and lengthen to 5 sentences. [this is commentary, not an assignment]

Read the abstract
Look for the hypotheses (perhaps at the end of the introduction)
Study the figures, then the tables. Consider that you may be able to simplify reading by identifying those results that are important vs. those that are less so. Should the paper be outside of your field, it is easy to become confused. Consider what it is that you really need to understand. Along the same lines, your interests may not match the topic. You should consider what you could ignore.

Read the text in the ‘Results’ section.
Make sure that you understand the figures and tables. Figures are easy to read but may need more attention than one initially assumes. Force yourself to look carefully at and extract the important information from the figures and tables. Is important information missing? In a very careful reading, one also may double-check figures with other data for internal consistency.

Conclusions:
What logic is used to get from results to conclusions? Are the conclusions justified and the interpretation appropriate? Are their claims inflated? Check to see whether the claims made in the abstract match the results in the paper.
Is the focus too narrow?
Can you identify implications that they missed?
Have they considered all of the alternative explanations?

Read the Methods:
Often, you would read the methods last:
Is the analysis justified and appropriate? Are the samples adequate?
Did they choose to execute the most appropriate experiment?
Was the experiment done correctly?
Have they captured the important results?
If the paper is in your field, review the methods carefully, how collected, how analyzed. If you lack sufficient background, you may not understand complicated statistical analyses (or phylogenetics, modeling). Reading with facility is another good reason to master statistics.
If a paper has equations or methods that you do not understand:
- these will be confusing
- see if you can ignore these and still follow the ‘Results’ and ‘Discussion’
If in your field, look for useful methods.

‘3C. Do you believe it?
As you follow the authors’ story line, also analyze. Dissect the authors’ analysis. Do not assume that most things have been figured out. In fact, research that is well executed and genuinely new is hard to come by. Authors may claim more than they have done. Be critical, skeptical. Be confident. If you have trouble understanding the logic, do not assume that the writer is correct and you are wrong. Your logic may be correct.

The questions:
Do you think that they posed the correct questions, in the right way?
Did they consider all of the alternatives and explanations?
The paper could provide an advance that is based solely on the analysis of/approach to the issue. Alternatively, the thinking could be muddled.

‘4. The next step
Does the paper indicate what might be interesting, productive next steps?
You should think about what might be the next steps.
Does the paper suggest any ideas for your own research?

‘5. Learning to write a paper from reading a paper
Analyze how the work is presented in order to learn how to write a paper. The paper could have been written in many ways. Hence, you should think about how the authors designed the paper. What design decisions did they make? How did they set up the introduction [so as to engage the reader]? How did they walk you through the results, discussion? Can you figure out their strategy? Can you devise a better strategy? Learn the art and craft of writing by ‘watching’ as you read. View the paper as a work of art.

Did they make the right decisions? Was the presentation as effective as it could have been?

Do details get in the way of the story? Did they lose the larger perspective by providing too much detail?

Compare the paper to a similar study to see an independent method for presenting similar material.

‘6. Should you maintain your own bibliography? What is the best way to do so? To be discussed in class.
Your evaluation, strengths in methods, new or useful ideas. Key words or folders
FileMakerPro or other relational database
Web of Science – search by citations, key words

‘7. Suggestions from graduate students: Reading a hard copy vs. on screen.
   On screen: Can put notes in pdf that are searchable.
Hard copy: Can mark up, quickly switch between tables, figs and text; easy to read quickly.
Practice by critiquing, writing analyses of papers.

[Tom’s notes - N: Fred Adler, Dale Clayton, Colleen Farmer (SB107). Y: John Sperry, Lynn Bohs, Dave Carrier, Franz Goller, Jon Seger, Wayne Potts, Don Feener, Lissy Coley, Jim Ehleringer, Dennis Bramble] Sept 13, 2009, saved as Biology_boot_camp\Toms_class\Toms_notes_Franz_papers.doc

FROM FRANS GOLLER. NON-READING MATERIAL THAT I WILL EXPLAIN IN CLASS
Glaze/Troyer Abstract and intro: We perceive syllables/gaps, motifs and song. How is this coded in the brain? Two models: hierarchical in which basic motor process are combined or universal in which the song is a single process, as in a music box.
The length of the song can change. This is not due to a change in the length of one or several sections with no change in others. Instead, the length of the syllable changes and the length of the gap does not change.
P1002 The music box model is not supported. The syllables are encoded in the brain as clustered units. P1003. It may be common to find that song is encoded (controlled) in the brain by processes that affect the song globally and other process that only affect the song locally.

Cooper/Goller Abstract: Changes in the speed at which a song is sung (tempo) require at least two neural oscillators: duration of expiration, which varies with a change of tempo and the duration of inspiration, which is fixed with a change of tempo
p3804 The oscillator that controls expiration varies with social context. A second oscillator that control inspiration does not vary with social context.