Lab #2: Reading Scientific Papers

Introduction:
The pace of discovery in science is extremely fast! Every month, hundreds of new scientific papers get released to the world, and often it can be difficult to keep up. For this reason, active scientists must read constantly. Here in the information age, acquiring scientific papers is easier than it has ever been in history. However, with the advent of digital media distribution, it also means that a huge amount of information must be sifted through just to get to what you are looking for, which can be daunting. Being able to make sense of who an author is writing to is a good first step.

The presentation of scientific information occurs in many different forms. For printed material (both paper and digital), this includes (a) online sources (such as Wikipedia), (b) popular science articles (such as Discover Magazine, Omni, or Popular Mechanic), (c) textbooks and (d) scientific journals (such as Science, Ecology, Nature, etc.).

- Internet sources like Wikipedia are often a good “first-look” if you are trying to get basic information that is common knowledge, however you must be very careful using such sources. The way in which Wikipedia works allows for massive amounts of information to be added and modified, but this process is not peer-reviewed – that is, there is no set of referees to verify the information. For that reason, you should never cite Wikipedia as a source when you are writing a scientific paper.

- Popular science articles can be very fun to read, usually because the magazine or author is attempting to inform while at the same time entertain the reader. Authors will usually take an interesting topic and will summarize the most current research, and will often include interviews with scientists who are leaders in the field or who conducted the research on which the article is based. Such articles usually go through the editorial process, but not in the same way as scientific journals. The author’s boss is usually the editor, whose job is to ensure the article is interesting enough to help sell the magazine. Because of this, biases can creep into such articles, for example when the magazine specifically intends to cater to a particular type of reader (e.g. Sierra Magazine). Interestingly, editors and authors usually refer to such works as “stories”. For this reason, we do not cite popular science articles as sources of information when we write papers in science.

- Textbooks are usually trusted sources for a synopsis of the most current information on a subject (such as biology, physiology, anatomy, etc.). The author of the book or chapter also must pass the information to an editor, however in this case, prior to sending it to the editor, the information is reviewed by a panel of experts in the field. This panel can check to make sure information is correct and current. Textbooks synthesize what is already known up to the point of publication. General textbooks (like the one we are using in this class) are typically not cited in journal articles, however for term papers, class essays, and work you do in college, textbooks are suitable to cite as a scholarly work. One caveat for journal papers is if the textbook is very specific in its focus and widely regarded by scientists. For example, a textbook on insect endocrinology, where a different author who is a recognized expert in their field writes each chapter.

- Journal articles are the most robust form of scientific information. They are not meant to “entertain” you. Most often, authors are presenting material that is new to science, or they are synthesizing information in a new way that has not been considered before. The reason it is considered the most highly regarded way to disseminate scientific information is because of the process that scientists must follow to get their work published. Authors must strictly follow the scientific method, and they must be careful to back up any claims with substantial evidence. When an author submits their manuscript for consideration to a journal, the editor of the journal will first determine if the work has merit. Most manuscripts never get past the editor, however if it is well written and has reasonably good information, the editor will then send it to three (or more) anonymous reviewers. These reviewers are experts on the subject covered by the manuscript. Anonymous reviewers are often very critical in their assessments – in order to keep the quality of work high, they will nit-pick every detail, and challenge every assertion and claim made by the author. They will determine if the scientific method was strictly followed, and ensure that the author’s logic is sound. Usually, they will rip the manuscript to shreds with a red pen! Most manuscripts get rejected by the anonymous reviewers. Very few get accepted outright. Some manuscripts get accepted with the provision that the authors revise their work taking into account the...
suggestions of the reviewer. All of this gets sent back to the editor who makes the final decision. The author
never gets to know who the anonymous reviewers are. And for this reason, the quality of journal articles
remains VERY high. Bad papers rarely make it through the review process.

Task For Today:

Goals
By the end of this lab session, each student should be able to:
1. Identify various writing styles.
2. Identify important points held within an article.
3. Determine the sections of a primary research article (Abstract, Introduction, Materials & Methods, Results,
   Discussion, Acknowledgements, & References).
4. Cite correctly.
5. Summarize a primary research article.

Materials
1. Two electronic journal articles downloaded from Blackboard.
2. 1 cut article.
3. 1 Science journal article.

Methods: Please write out the answers to the following questions. A summary assignment appears at the end
(section D below). This should be shown to me before you leave lab today. Save and keep this assignment. You
will not hand it in, but it will be useful to you for future labs.

A) Please answer the following questions about the two articles you chose.

1) What is the title of the article and who is the author?
2) Who is the audience?
3) What was the general topic that this author addressed?
4) Where did the author get his/her information (see cited work)?
5) What was the main point of the article?
6) What was the hypothesis? If it wasn’t clearly stated, can you re-state what the hypothesis should be?
7) Describe the methods that were used during this experiment or field work.
8) Did this article report any statistics to support or refute the hypothesis? What is the name of the statistical
   methodology? (Note: you don’t have to explain the statistics!)
9) Were the seven sections of a primary research article represented? If not, identify which sections were not
   mentioned?

B) Chopped up article:
I will pass out a chopped up article. Work with your team to put it together. Discuss why you chose the article to be
in that order. What clues are in the article that helped you make those decisions? Did the article follow the primary
journal article sequence?

The rest of the lab will be conducted on your own pace. Please feel free to take a break if you get tired. It's
interesting that, even though you are probably just sitting in one place, reading journal articles can be VERY
tiring! This is because your brain must be fully functioning in order to process the dense amount of
information therein.

C) Please answer the following questions about the Science article you chose.

1) You should randomly choose a Science journal and quickly flip through its pages. What scientific
disciplines are represented in this journal (mathematics, ecology, physics, etc.)?
2) Identify the title of the journal, the year it was published, the volume, and the number.
3) Open the journal to the table of contents.
4) Look up the Perspectives section and turn to that page.
5) Identify the title and author of one Perspectives article.
6) What type of article is found under this section (popular, summary, primary, or review)?
7) What type of audience is this article written for?
8) Who is the audience for this type of article (scientists, regular people, students, etc.)?
9) Were the seven sections of a primary research article represented? If not, identify which sections were not mentioned?
10) How does the content found in this article different from the content found in the articles on handout? Which type of article contains more detailed information?
11) Look up the Reports section and turn to that page.
12) What is the title of the article and who is the author?
13) What type of article is found under this section (popular, summary, primary, or review)?
14) What type of audience is this article written for?
15) Were the seven sections of a primary research article represented? If not, identify which sections were not mentioned?
16) How does the content found in this article different from the content found in the articles on handout and in the Perspectives section? Which type of article contains more detailed information?

D) Answer these questions and think about them for the quiz next week. Use a primary journal article for the following activity – have it be different from the ones you chose above. Try to find a short paper.

1) Identify the year, journal title, author, and article title. And put it in the following format: Author’s last name, first initials. Year the journal was published. Title of the article. Journal Title. Volume (Number): Page-Page.
2) What question is the author addressing?
3) Why was the study conducted? What lead the author to ask his/her question?
4) What was the author’s hypothesis?
5) How did the author test his/her hypothesis? State specifically the procedures they followed in the proper order.
6) Name the variables: independent, dependent, controls, and standards.
7) What were the results of the experiment?
8) Did the results support or reject their hypothesis?
9) Did the author run any statistics?
10) What were the major findings or conclusions of the study?
11) How do the results relate to the previous findings of other scientist?
12) Did the author suggest any future studies?
13) Did the author mention any problems with his/her experiment?
14) What did you find interesting about this paper?
15) Are there any problems with this article?
16) Did you come up with any questions about the article? Can you suggest further research that the author should consider?