Name_____

How to Read a Scientific Article

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Science articles are one of the most important ways that scientists communicate with one another. The main purpose of a scientific paper is to report new results, usually experimental, and to relate these results to previous knowledge in the field. Unfortunately, many science papers are difficult to read and understand. Some of the difficulties may be due to the content of the paper, but it usually due to how the article is written. Many papers are poorly written. Some scientists are poor writers. Many others do not enjoy writing, and do not take the time or effort to ensure that the prose is clear and logical. Also, the author is typically so familiar with the material that it is difficult to step back and see it from the point of view of a reader not familiar with the topic and for whom the paper is just another of a large stack of papers that need to be read. This assignment is designed to help you read science articles.

Most scientific journals and papers follow a standard format. They are divided into several sections with each section serving a specific purpose in the paper. I will describe the standard format but just understand that there may be some variations on the format.

In understanding how to read a paper, we need to start at the beginning with a few preliminaries. We will then address the main questions that will enable you to understand and evaluate the paper.

Anatomy of a Science Article

A paper usually begins with a short **Summary** or **Abstract**. In general, it gives a brief background to the topic, concisely describes the major findings of the paper and relates these findings to the field of study. This order is also that of the paper as a whole.

The next section of the paper is the **Introduction**. In some journals, this section may not be given a title. As its name implies, this section presents the background knowledge necessary for the reader to understand why the findings of the experiment will contribute knowledge in the field of study. Typically, the Introduction describes the accepted state of knowledge in a specialized field; then it focuses on a particular aspect, usually describing a finding or set of findings that led directly to the work described in the paper. If the authors are testing a hypothesis, the source of that hypothesis is spelled out, findings are given with which it is consistent, and one or more predictions are given. In many papers, one or several major conclusions of the paper are presented at the end of this section, so that the reader knows the major answers to the questions just posed.

The next section of most papers is the **Materials and Methods**. In some journals this section is the last one. Its purpose is to describe the materials used in the experiments and the methods by which the experiments were carried out. In principle, this description should be detailed enough to allow other researchers to replicate the work. In practice, these descriptions are often highly compressed, and they often refer back to previous papers by the authors.

The next section is usually the **Results**. This section describes the experiments and the reasons they were done. Generally, the logic of the Results section follows directly from

that of the Introduction. That is, the Introduction poses the questions addressed in the early part of Results. Beyond this point, the organization of Results differs from one paper to another. In some papers, the results are presented without extensive discussion, which is reserved for the following section. This is appropriate when the data in the early parts do not need to be interpreted extensively to understand why the later experiments were done. In other papers, results are given, and then they are interpreted, perhaps taken together with other findings not in the paper, so as to give the logical basis for later experiments.

The next section is the **Discussion**. This section serves several purposes. First, the data in the paper are interpreted. The data is analyzed to show what the authors believe the data show. Any limitations to the interpretations should be acknowledged, and fact should clearly be separated from speculation. Second, the findings of the paper are related to other findings in the field. This serves to show how the findings contribute to knowledge, or correct the errors of previous work. As stated, some of these logical arguments are often found in the Results when it is necessary to clarify why later experiments were carried out. Although you might argue that in this case the discussion material should be presented in the Introduction, more often you cannot grasp its significance until the first part of Results is given.

Finally, papers usually have a short **Acknowledgements** section, in which various contributions of other workers are recognized, followed by a Reference list giving references to papers and other works cited in the text. Lastly, the author may describe its **Funding Source** for the research performed.

Where Do I Start?

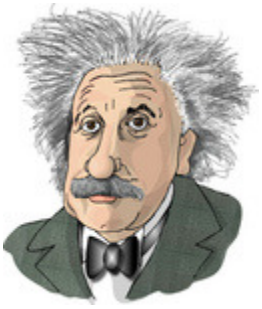
Although it is tempting to read the paper straight through like a novel, it is more efficient to organize the way you read. I highly recommend that you have access to scientific dictionary and a note pad to write some notes as you read the article. This will allow you to organize your thoughts as you read through the article.

Generally, you should first read the **Abstract** in order to understand the major points of the work. This will give you a brief summary of the entire study and its findings. Next, read the **Introduction** and **Results/Discussion** while skipping the **Materials and Methods**. You may refer back to this section as needed to clarify what was actually done in the experiment.

Reference: http://www.biochem.arizona.edu/classes/bioc568/papers.htm

Assignment

1. Select a science article from the class web site.
2. Read the article and take notes as you read the article. (Attach your notes to the assignment)
3. Answer the following questions.



Questions

1. Name the Journal;
2. Title of the Article;
3. List the Authors;
4. Date published;
5. Who is the primary author of the article and where is he/she working?
6. Who do you contact if you have any questions?
7. What is the purpose of an Abstract?
8. What is the hypothesis/claim being tested in your paper?
9. Briefly describe how their hypothesis/claim was tested.
10. Was there a control conducted in the experiment? If yes, explain the control.

11. What did they conclude from their experiment/studies?

12. Did they suggest any further experiments or research that could be done to further their studies? Explain.

13. In the body of an article you may see sentences like these:

" High concentrations of floating plastic debris have been found in the Pacific Ocean **(11-14)"**

or

" …11 of the 12 yr between 1995 and 2006 were the warmest on record **(Brohan et al. 2007)"**

What do the bold portions of the text refer to?

14. Write one example of a reference within your article and its link to its reference at the end of the article.

15. Assume you wrote a paper and you used this article as a source in your paper. How would you see it written in your references?

16. What is the Funding Source of the research performed?

17. Explain how the Funding Source could possibly have an impact on the results of a research project?