Importance of the Scientific Journals

Scientific journals are usually considered the most important primary sources of information. A **scholarly scientific journal** contains a collection of articles, usually published on a regular schedule, written by scholars reporting the results of experimental investigations. The intended audience for scholarly journal articles is other experts in the field. Articles conform to a specific structure, dictated by the discipline and the particular journal, and may include article title, author(s), author affiliation, introduction, method, results, analysis, discussion, and a bibliography of literature cited. They may also include data tables, graphs, charts, detailed drawings, and photographs. Research articles submitted to scholarly journals for publication undergo an evaluative process known as peer review. (See below)

Scholarly scientific journals serve three major **functions** in the process of scientific communication:

The **social** role of scientific journals is to establish and maintain intellectual property, so that the creative work of a scientist receives the recognition of peers.

The **archival** role is to provide a "statement of knowledge that has been evaluated and declared acceptable by the scientist's peers." All articles submitted for publication in a refereed, scholarly journal are subjected to a **peer review** process by experts in the author's area of research to determine whether the work is accurate, reliable, and worthy of publication. *The peer review process serves to maintain the quality of the scientific literature by sorting out the good science from the bad before publication* [emphasis added]. As a result of this monitoring, scientists can be more confident in building their research on the work of others as reported in the literature.

Finally, journals serve as a vehicle for the **rapid dissemination** of information, which is essential because of the cumulative nature of science.

How to Read a Scientific Research Paper- a four-step guide

Reading research papers ("primary articles") is partly a matter of experience and skill, and partly learning the specific vocabulary of a field. First of all, DON'T PANIC! If you approach it step by step, even an impossible-looking paper can be understood.

1. **Skimming.** Skim the paper quickly, noting basics like headings, figures and the like. This takes just a few minutes. You're not trying to understand it yet, but just to get an overview.

2. **Vocabulary.** Go through the paper word by word and line by line, underlining or highlighting **every word and phrase** you don't understand. Don't worry if there are a lot of underlinings; you're still not trying to make sense of the article.

Now you have several things you might do with these vocabulary and concept questions, depending upon the kind of question each is. You can

a. **Look up simple words and phrases**. Often the question is simply vocabulary--what's a *lateral malleolus,* or a *christa*, or the *semilunar valve.* A...**biological dictionary** is a good place to look for definitions.... Your **ordinary shelf dictionary** is **not** a good source, because the definitions may not be precise enough or may not reflect the way in which scientists use a word (for example "efficiency" has a common definition, but the physical definition is much more restricted.)
b. **Get an understanding from the context in which it is used.** Often words that are used to describe the procedures used in an experiment can be understood from the context, and may be very specific to the paper you are reading. Examples are the "lithium-free control group" in a rat experiment or the "carotene extraction procedure" in a biochemical experiment. Of course, you

should be careful when deciding that you understand a word from its context, because it might not mean what you think.

c. **Flag this phrase as belonging to one of the major concepts of the paper**--it's bigger than a vocabulary question. For example, a paper about diet and cancer might refer to "risk reduction," which you would need to understand in context and in some depth.

3. **Comprehension, section by section.** Try to deal with all the words and phrases, although a few technical terms in the Methods section might remain. Now go back and read the whole paper, section by section, for comprehension.

- In the **Introduction**, note how the context is set. What larger question is this a part of? The author should summarize and comment on previous research, and you should distinguish between previous research and the actual current study. What is the hypothesis of the paper and the ways this will be tested?
- In the **Methods**, try to get a clear picture of what was done at each step. What was actually measured? It is a good idea to make an outline and/or sketch of the procedures and instruments. Keep notes of your questions; some of them may be simply technical, but others may point to more fundamental considerations that you will use for reflection and criticism below.
- In **Results** look carefully at the figures and tables, as they are the heart of most papers. A scientist will often read the figures and tables before deciding whether it is worthwhile to read the rest of the article! What does it mean to "understand" a figure? You understand a figure when you can redraw it and explain it in plain English words.
- The **Discussion** contains the conclusions that the author would like to draw from the data. In some papers, this section has a lot of interpretation and is very important. In any case, this is usually where the author reflects on the work and its meaning in relation to other findings and to the field in general.

4. **Reflection and criticism.** After you understand the article and can summarize it, then you can return to broader questions and draw your own conclusions. It is very useful to keep track of your questions as you go along, returning to see whether they have been answered. Often, the simple questions may contain the seeds of very deep thoughts about the work--for example, "Why did the authors use a questionnaire at the end of the month to find out about premenstrual tension? Wouldn't subjects forget or have trouble recalling?"

Evaluating a Paper, [Additional Things to Consider]

1. **What questions does the paper address?** In a well-written paper, the Introduction generally goes from the general the specific, eventually framing a question or set of questions.... In addition, the results of experiments usually raise additional questions, which the authors may attempt to answer.
2. **What are the main conclusions of the paper?** This question can often be answered in a preliminary way by studying the abstract of the paper. Here the authors highlight what they think are the key points. This is not enough, because abstracts often have severe space constraints, but it can serve as a starting point. Still, you need to read the paper with this question in mind.
3. **What evidence supports those conclusions?** Generally, you can get a pretty good idea about this from the Results section. The description of the findings points to the relevant tables and figures. This is easiest when there is one primary experiment to support a point. However, it is often the case that several different experiments or approaches combine to support a particular conclusion. For example, the first experiment might have several possible interpretations, and the later ones are designed to distinguish among these.
4. **Why are the conclusions important?** Do the conclusions make a significant advance in our knowledge? Do they lead to new insights or...new research directions?