

Why read primary literature?

- It's where science is *happening* now – materials in text books and other books are often several years old by the time they make it to print. Scientific journals are published several to many times a year, and thus they contain the latest developments in a field.
- Reading primary literature allows you to form your own opinion. Unlike textbooks, publication in primary literature is often the first time ideas see the page – i.e. the ideas put forth in a paper have yet to be critiqued by the scientific community at large. (The ideas have been critiqued through the peer-review processes, but this typically involves only a few individuals within the field). Some published papers are poorly written or represent (arguably) less-than-optimal science, and thus they are not read by many people. Other papers are very well written, read by many, have a large impact, and withstand the test of time. You get to decide if a paper falls in the former or latter category (or in between).

How scientific literature differs from secondary literature (e.g. text books)?:

Primary Literature	Secondary Literature
Narrow focus	Broad focus
Peer-reviewed	Not necessarily peer-reviewed
Methods described in detail	Methods not necessarily described
Data presented	Data not necessarily presented
Literature cited	May or may not have literature cited

Tips for reading scientific literature:

- **Read the abstract first.** It contains all the essential information of the paper. You should be able to answer all questions posed below, in a general sense, after reading the abstract.
- **After the abstract, you don't necessarily have to read the paper in order.** You may pick and choose what to read next. In fact, because so many people pick and choose their way around the methods section, high-profile journals, e.g. *Science and Nature*, place the methods section at the end of the paper.
- **Focus on the figures (and tables)!** Many folks look at the figures of a paper first and only then read the text. The figures are the story board for the paper – all the main conclusion must be evident from the data presented in the figures and tables. When you interpret a figure, you should be able to answer the following questions:
 - How were these data obtained?

- What is the main pattern I'm supposed to see in this figure? It is statistically robust?
- Why is this pattern important, given the questions / hypotheses the paper is focused on?
- What does this pattern mean to me, and is my interpretation consistent with the author's interpretation? You may not agree with the author, and this is ok.

Know what to look for in each section:

By the time you finish each section of a paper, you should be able to answer the following questions. If you can't, either you've missed the main points and/or the paper is poorly written.

Introduction: Why is the subject important, what questions does this study address or what hypotheses is it testing?

Methods – What did the authors do to address the questions posed? The scope at which a reader understands all the details in the method section varies. Those in the same field may read the method in detail because (s)he is interested in using the same approach. Readers outside of the field may only get a broad sense of how the study was done without understanding the nitty gritty.

Results – What did the authors find? This is where the raw data are present, so readers can come to their own conclusions (if they choose). The presentation of the data here should be without interpretation – i.e. just describing patterns, not inferring processes.

Discussion – Given the patterns described in the results section, what do they mean? What processes are inferred from the patterns? Why are these inferences important, and how do they impact the field? Were the main questions or hypotheses addressed?