

## Hints for Effective Reading of the Literature

Below are a few helpful comments on techniques for reading the literature effectively and efficiently.

### 1. Questions to consider while reading

Consider the following questions as you read through the paper, and take down notes with your answers. This not only helps you to remember the concepts in the paper, but also exposes points about which you may be unclear. And your notes will come in handy for our discussions of each paper in class.

(a) **What is the science question addressed by the paper?**

This can be one of the most difficult questions to answer if the paper is not well written, yet it is one of the most important questions that the paper should answer extremely clearly.

(b) **What is the method used to address the science question?**

In particular, you want to identify any assumptions made in the work and explicitly state the limitations of the approach. Many papers do not explicitly state the assumptions or limitations of the work presented, either because the authors do not want to minimize the impact or applicability of their work, or because they are not aware or have not considered the limitations of their method.

(c) **Create a short, bullet point list of the “citeable” results in the paper.**

Some papers are very focused on just a single citeable result, but others may have a number of results that merit citation. What was achieved in this paper, why was it published, and why would you cite it?

(d) **Are there any red flags?**

Are there any parts of the paper that you did not understand? Did something stated in the paper seem wrong, or in contradiction with what you know? If so, it can simply mean that the idea was not explained well, but more often it means that there is something questionable about the work. Trust your scientific intuition.

### 2. Place the work into a familiar context

As you read through the paper, try to place the concepts discussed into the context of what you personally know. How is the discussion in the paper related, if at all, to your own research interests and experience? This task becomes easier as you become a more experienced a scientist, but it still remains a challenge even for the experts of the field. Although this task requires the constant challenge of making connections from your own knowledge base to the work in the paper you are reading, it is the most effective way to assimilate the scientifically valuable information in the paper into your own knowledge base. Strive to make the connection, because you will often learn something valuable in the process.

### 3. Read the abstract again after you have finished reading the paper.

After you have finished reading the paper, read through the abstract again to be sure that you understood everything that the authors considered important enough to put into the abstract.

### 4. Create an Annotated Bibliography

The answers to the questions in #1 above contain all of the information that you would use to construct an annotated bibliography. This can be a very useful tool for keeping track of all of the important results of the body of literature about a particular topic in an organized way.

### 5. The Quick Reading

A well written paper does not need to be read word for word to be understood. Just reading the abstract, introduction, and conclusions should tell you everything important that you need to take away from the paper. The rest of the paper should contain the more detailed information needed to explain *exactly* what was done, and so that the work could be repeated by others, if necessary.

If you do read the entire paper, you should get something from the rest of it. Many papers contain some amount of unnecessary filler—words which convey no new or useful information (we are all guilty of writing this way to some extent, and that is why we revise our papers extensively before submission).

6. A few other comments

- (a) Above all, a paper should be clear and organized. For example, speculative discussion should not suddenly appear unexpectedly in the section presenting the results, leading the reader to believe that this is part of the work that has been done.
- (b) It is OK to include some information in the paper that is related to the main scientific argument but is not essential to that argument. But this information does need to convey something new and interesting.
- (c) We all read differently and may get different messages from the same paper. Hopefully this will engender some lively discussion during our class meetings.
- (d) Most people only associate a single citeable result from a particular paper. Papers that contain more than one message need to be very clear about the main points to take away from the paper.
- (e) An important thing to learn is the limitations and assumptions that support fundamental results in the literature. Sometimes well accepted results turn out to be wrong, and it is usually because a forgotten (or unstated) assumption has been violated.