Paper Discussion guidelines

Reading a scientific paper is not like reading a news article. Papers are too dense and too difficult to be read once from start to finish. You will find that you might need to read it 3 or 4 times before you understand what is going on.

1. Skim the article and identify its structure.
Most journals use a conventional IMRD structure: An abstract followed by Introduction, Methods, Results, and Discussion. Each of these sections normally contains easily recognized conventional features, and if you read with an anticipation of these features, you will read an article more quickly and comprehend more.

Features of Abstracts
Abstracts usually contain four kinds of information:
• purpose or rationale of study (why they did it)
• methodology (how they did it)
• results (what they found)
• conclusion (what it means)
Most scientists read the abstract first. Others—especially experts in the field—skip right from the title to the visuals because the visuals, in many cases, tell the reader what kinds of experiments were done and what results were obtained. You should probably begin reading a paper by reading the abstract carefully and noting the four kinds of information outlined above.
Then move first to the visuals and then to the rest of the paper.

Features of Introductions
Introductions serve two purposes: creating readers' interest in the subject and providing them with enough information to understand the article. Generally, introductions accomplish this by leading readers from broad information (what is known about the topic) to more specific information (what is not known) to a focal point (what question the authors asked and answered). Thus, authors describe previous work that led to current understanding of the topic (the broad) and then situate their work (the specific) within the field.

Features of Methods
The Methods section tells the reader what experiments were done to answer the question stated in the Introduction. Methods are often difficult to read, especially for students, because of technical language and a level of detail sufficient for another trained scientist to repeat the experiments. However, you can more fully understand the design of the experiments and evaluate their validity by reading the Methods section carefully.

Features of Results and Discussion
The Results section contains results—statements of what was found, and reference to the data shown in visuals (figures and tables). Normally, authors do not include information that would need to be referenced, such as comparison to others' results. Instead, that

material is placed in the Discussion—placing the work in context of the broader field. The Discussion also functions to provide a clear answer to the question posed in the Introduction and to explain how the results support that conclusion.

Atypical Structure
Some articles you read will deviate from the conventional content of IMRD sections. For instance, Letters to Nature appear to begin with an abstract, followed by the body of the article. Upon reading, however, you will see that the "abstract" is a summary of the work filled with extensive introduction (for the purpose of catching the attention of a wide audience), and the next paragraph begins a description of the experiments.

Therefore, when you begin to read an article for the first time, skim the article to analyze the document as a whole. Are the sections labeled with headings that identify the structure? If not, note what the structure is. Decide which sections contain the material most essential to your understanding of the article.
 Then decide the order in which you will read the sections.

2. Distinguish main points.
Because articles contain so much information, it may be difficult to distinguish the main points of an article from the subordinate points. Fortunately, there are many indicators of the author's main points:

Document level
*   Title
*   Abstract
*   Keywords
*   visuals (especially figure and table titles)
*   first sentence or the last 1-2 sentences of the Introduction
in contrast with previous work has seldom been addressed
*   Conclusion

Paragraph level:
Words or phrases to look for
surprising, unexpected, we hypothesize that, we develop, we propose, the data suggest , we introduce…

Start you reading with the abstract, and write down the main conclusions of the paper. Then, move to the introduction, which will help you understand the context. Then, read the result, and fill in the list of major points the authors are making. Read the methods section last.

3. In depth reading
For each of the main points the authors are making, identify the evidence for it by looking at the figures, at the text of the results and method sections. Ask yourself :
    -   Is the data quality good enough?
    -   Is the method they used appropriate?

- Is their result convincing?
- Is there an alternative interpretation of the data that the author did not address?

In particular, take care to make the difference between a proven result and a hypothesis.

4. Prepare for the class discussion

Prepare an introduction to the paper:

There are probably difficult things to understand in the introduction. Do some research about it, or ask the Professor if you need help. Present a short introduction to help the class with the necessary background

Present the main points.

Prepare a slide of each of the main points, identifying the conclusion and the evidence. Discuss the evidence with the class.

Each of the figures of the paper should naturally find their place in the main point slides. Be sure to properly present the figures: state what is on each axis, what it is showing, and what the conclusion taken from the figure.

Make a summary slide