

paragraph. The result of each paragraph is a logical statement, and paragraphs farther down in the text rely on the logical conclusions of previous paragraphs, much as theorems are built in mathematical literature.

Rule 8: Discuss how the gap was filled, the limitations of the interpretation, and the relevance to the field

The discussion section explains how the results have filled the gap that was identified in the introduction, provides caveats to the interpretation, and describes how the paper advances the field by providing new opportunities. This is typically done by recapitulating the results, discussing the limitations, and then revealing how the central contribution may catalyze future progress. The first discussion paragraph is special in that it generally summarizes the important findings from the results section. Some readers skip over substantial parts of the results, so this paragraph at least gives them the gist of that section.

Each of the following paragraphs in the discussion section starts by describing an area of weakness or strength of the paper. It then evaluates the strength or weakness by linking it to the relevant literature. Discussion paragraphs often conclude by describing a clever, informal way of perceiving the contribution or by discussing future directions that can extend the contribution.

For example, the first paragraph may summarize the results, focusing on their meaning. The second through fourth paragraphs may deal with potential weaknesses and with how the literature alleviates concerns or how future experiments can deal with these weaknesses. The fifth paragraph may then culminate in a description of how the paper moves the field forward. Step by step, the reader thus learns to put the paper's conclusions into the right context.

Process (Rules 9 and 10)

To produce a good paper, authors can use helpful processes and habits. Some aspects of a paper affect its impact more than others, which suggests that your investment of time should be weighted towards the issues that matter most. Moreover, iteratively using feedback from colleagues allows authors to improve the story at all levels to produce a powerful manuscript. Choosing the right process makes writing papers easier and more effective.

Rule 9: Allocate time where it matters: Title, abstract, figures, and outlining

The central logic that underlies a scientific claim is paramount. It is also the bridge that connects the experimental phase of a research effort with the paper-writing phase. Thus, it is useful to formalize the logic of ongoing experimental efforts (e.g., during lab meetings) into an evolving document of some sort that will ultimately steer the outline of the paper.

You should also allocate your time according to the importance of each section. The title, abstract, and figures are viewed by far more people than the rest of the paper, and the methods section is read least of all. Budget accordingly.

The time that we do spend on each section can be used efficiently by planning text before producing it. Make an outline. We like to write one informal sentence for each planned paragraph. It is often useful to start the process around descriptions of each result—these may become the section headers in the results section. Because the story has an overall arc, each paragraph should have a defined role in advancing this story. This role is best scrutinized at the outline stage in order to reduce wasting time on wordsmithing paragraphs that don't end up fitting within the overall story.