

“The Craft of Scientific Writing” by Michael Alley, Chapters 1-3

November 4, 2009

The presenters Regina Carns and Nick Castle provided a summary of the first three chapters of Alley's book, including examples of the main points using their own presentation as an analogy. We, the class, agreed during discussion that the book covers a wider scope of scientific writing than the scientific journal articles that we hope to write and publish, but concluded that most of the rules apply to us. Some disagreed about whether Alley wrote well in this book, but we didn't debate the point. Alley for the most part follows his own rules.

Chapter 1 of Alley's book is about the beginning of the writing process. Alley advises to get started on a paper by consciously considering the **constraints**, which are the audience, the format, the mechanics, and the politics. The paper's **audience** and their background knowledge of the topic should determine the necessary terms to define, the illustrations or metaphors to include, and the depth of the paper. The prescribed **format** of the paper should also constrain the depth and set organizational guidelines. Disobeying rules of grammar and punctuation (which Alley defines as **mechanics**) will irk the audience and diminish the audience's opinion of the writer's professionalism and abilities. Finally, the **politics** surrounding the work may also constrain how the writer presents her ideas.

Alley argues that establishing the four points above first will help to improve writing. We discussed several situations that show the importance of these constraints. TAs may give a higher grade to a paper with bad science and good writing than to one with good science and bad writing. Thus, bad **mechanics** can undermine good science. Mechanics may vary for different English-speaking countries (e.g. UK and USA). Tailoring words and phrases to fit the grammar of the publishing country is not a major concern for the writer, because the editor will probably translate the document. Particular care, however, must be taken with units. In the US, “billion” means 10^9 , while in Britain it means 10^{12} , so the writer must be explicit about what the units mean (e.g. ppb (parts per 10^9)). We discussed whether **politics**, the fourth constraint, are relevant for our writing. Although not as salient as in a document concerning a product's safety, we found ways in which politics can influence scientific journal articles. The audience and purpose of the particular journal may influence the submitted paper's emphasis and phrasing of controversial ideas. In another case, even though a writer is pressed to be honest throughout her paper, political constraints may also discourage the writer from addressing her best ideas for future work, especially if she plans to follow-up current research with other experiments.

Next, Alley defined a paper's **style** in terms of its structure, language and illustration. How the writer chooses to arrange words, sentences, paragraphs, sections, and illustrations defines her style, and the writer aspires towards clarity and precision. Alley's illustration of the goals of language in scientific writing is itself unclear and undermines his argument.

Chapter 2 covers **structure**, or document organization. Alley describes the basic elements of a scientific paper (i.e. title, summary, introduction, etc.) in much repetitive detail. The reader first encounters the **title**. The title should be specific enough to allow any audience to know what field of study the paper is on and what topic the paper addresses but should not turn into a long jargon-filled word-salad. One way to improve the title is by transforming a long sequence of noun modifiers into prepositional phrases.

The **summary**, or what we think of as the abstract, orients the audience to the topic and can be descriptive or informative. A descriptive summary depicts the structure/organization of the paper, while an informative summary focuses on the results and the methods. An excellent point was made during our discussion: avoid phrases such as 'are discussed' and 'are described' in the abstract, since they are vague and weak.

The **introduction** follows the summary. Before writing the introduction, the writer must answer

four questions: What exactly is the work? Why is the work important? What is needed to understand the work? How will the work be presented? Answering the first two questions in the introduction will help the writer persuade the audience to read the paper. This can be accomplished by showing the importance of the work or by building the audience's curiosity. At all costs, the writer must avoid telling the audience that the work is important or assuming the audience is already convinced of the importance of the work.

After getting the audience acquainted with the background in the introduction, the writer presents the **main results** of the research. Before writing this section, the writer must determine the depth and the logical progression of the argument. Both the depth and the logical progression depend on the audience and the format as discussed in Chapter 1. The **depth** must be adjusted to the audience's interest, knowledge, and purpose. The **logical progression** can follow chronology, spatial progression, comparisons and contrasts between different aspects, or logical arguments leading to a conclusion. Again, the choice of logical progression depends on the smoothest way that the writer can lead the audience to her point of emphasis. Headings are good road signs that help the audience along. Their phrasing, however, must follow the logical progression of the paper. The grammatical structure of words used in headings should also be consistent. For example, using both noun phrases and participial phrases in headings will confuse the audience by breaking the expected pattern.

The writer wraps up the paper with the **conclusion**. Though not always necessary, the summation of the results and the expectation for future work should be addressed in the conclusion. The conclusion should also be short in length, about 5-10% of the whole paper, and should be similar to the initial summary. This repetition of the same format in the summary and in the conclusion brings closure to the audience with the sense that the audience has come back full circle. The writer can provide more insight about broader conclusions that connect all pieces of the main results than in the summary, since the writer can assume that the audience has read the rest of the paper.

Even if a paper is well-organized with an introduction, middle, and conclusion, Chapter 3 shows that the audience can get lost if the paper lacks proper transition, depth, and emphasis. Good **transition** sentences repeat headings, begin with background material, and ease the audience from one topic to another. Bad transitions tell, but don't show, the connection between sections, overload the audience with new information, and raise the audience's expectations too high for the punch-line to be effective.

The audience can also get lost, if the **depth** of the paper is inappropriate to the format and to the audience's background. Whether it is a journal article, a PowerPoint presentation, or a full-length report, the format determines the depth by constraining the available space the writer has to present her ideas. For example, a crammed PowerPoint slide with many details will be ineffective in conveying the main point to the audience.

Finally, even if the audience is able to follow the writer's explanations throughout the whole paper, the audience will not come out with a good understanding of what the writer meant to say in her paper, if the writer fails to emphasize the main point of the paper. **Emphasis** can be accomplished through repetition, placement, and a reduced number of points. As Alley states throughout his book, repetition is not equal to redundancy when the repetition is necessary for emphasis. Repetition helps to remind the audience of the points that the writer wishes to emphasize. The point of emphasis must be carefully placed if the audience is to identify the point of emphasis. Sentences and words close to white space, such as the first or last sentences of a paragraph or section, are ideal places to put the point of emphasis. This placement allows the audience to think about the point before digesting more ideas. All the above will be for naught, however, if the writer emphasizes too many points. The audience can retain only so many points before some are lost. In discussion, we learned that boring inessential points can be deleted or moved to an appendix, and an interesting point that isn't key to the central results of the paper may be better off being made into its own paper. We also discussed how reading our own writing from the perspective of a naive audience can improve the paper, noting where emphasis and depth may need to be changed to enhance the document's clarity.