The purpose of scientific writing is to inform the reader. In order to do this, one must think critically about one’s writing as well as make the writing clear for the audience. It is useful to think of scientific writing as a craft. The first step in writing a scientific document is to identify four principal constraints. They are as followed, as outlined in Alley, Chapter 1:

1. **Audience of the document**

   It is imperative to know the audience, and authors should craft their scientific documents based on four points. That is, who they are writing for, what the readers know, why they’re reading it, and how they are going to read it. Scientific writing can be difficult in this respect, because the audience can vary greatly, unlike audiences for other types of writing (e.g. journalism). Writing efficiently is very important. Scientific documents often leave the “best for last”; i.e. stating the most interesting/exciting results in the conclusion. In order to keep the reader’s attention it is worthwhile to include the major results early on (e.g. summary). It’s important to know the audience and to craft the document accordingly.

2. **Format of the document**

   The format includes the arrangement of text on the page, the numbering of pages (or the absence of numbering), the way sources are referenced, and the length of the document. Format is usually out of the author’s control, especially in scientific writing, where journals dictate the format. Instead of fussing over format, Alley suggests focusing on pieces that are under the author’s control, e.g. style. Various stylistic tools were mentioned in class. Examples include writing concisely, being aware of different languages, use of paragraphs, first-person and third-person writing perspectives, active/passive voices, and others.

3. **Mechanics of the document**

   Mechanics encompass the rules of grammar and punctuation. This can be a frustrating topic due to the intricacy of these topics as well as inconsistencies in their usage, even among scholars devoted to the field. There is a significant gray area in mechanics and some decisions will come down to the particular medium that the article is written for (similar to format). If it weren’t bad enough, the English language is constantly changing, so that the author must be aware of new additions as well as those that are outdated (e.g. from class: ‘impact’).

4. **Politics surrounding the document**

   Arguably, the most difficult constraint is politics. Ideally, honesty would be most important in writing a scientific document. However, writing can often be altered by outside influences (e.g. bureaucracy). Alley confesses that this constraint is practically unavoidable, and political influence in scientific writing is here to stay. His main suggestion, in the case where politics affect one’s writing, is to struggle to minimize any such influence in parts of the document.

**Style**

The final part of chapter 1 refers back to style (included under the format constraint). No universal definitions exist for style with regard to scientific writing. Alley offers a broad classification: style is the way in which the author casts their thoughts into words and images. This definition is supplemented with subcategories, including:

- Structure
Provides transition, depth and emphasis

- Beginning (title, intro)
- Middle (method, discussion, result)
- Ending (conclusion)

- Language
  - Six goals
    1. Precise
    2. Clear
    3. Forthright
    4. Familiar
    5. Concise
    6. Fluid

- Illustration
  - Meshing of words with images

**Structure**

- **Title**
  
  Chapter 2 focuses on structure. The first topic encountered here, that Alley considered to be the single most important piece of a document, the title. The title has some basic yet essential goals:

  - Identify the field of study
  - Separate the document from other documents in the field
  - Provide a specific and clear idea to the reader

The example given in class by Aaron Brewer was a paper title:

“Evaluation of Land Snails for Clumped Isotope Paleothermometry: A Case Study of the Pleistocene of Bermuda”

Suggestions included:

- Removing “Evaluation of”
- Specifying the age (e.g. 5 Ma vs. Pleistocene OR both)
- Rearranging “Bermuda during the Pleistocene” (this may be a convention that is field-specific)

- **Summaries**

  The focus then moved onto summaries (i.e. abstracts). The quote “readers who are truly interested in the work will continue reading” was used in the presentation. This sparked a discussion. As scientists, we want to interest our peers as well as the general public. Is it possible or even worthwhile to craft an abstract to speak to those familiar with your field or leave it for a broad audience? The consensus on this is contextual and that, ultimately, it’s a fine balance.

  Also, discussed was how numbers included in the body of the text can be viewed as clutter and confuse the reader. Obviously, if many numbers need to be displayed, a table is a convenient method to show them. We discussed how to avoid clutter and when a table (or figure) is necessary. This is another topic that seems dependent on context; however, if in doubt, use a table.
• **Introduction**

When reading an introduction, the reader expects to have some basic questions answered. Specifically:

- What is the work?
- Why is it important?
- What is needed for understanding?
- How will it be presented?

The introduction does not necessarily have to address all four of the above points; this depends both on the work and on the audience. The introduction is a good place to state the boundaries of your work. This includes the scope and limitations. It should also point out the importance of the work. By contrast, motivate your work in the introduction. The detail of the motivation depends on the audience. Background material should be included to supplement motivation. Alley suggests brevity; provide only the background necessary to the reader for this specific work. This avoids distracting the reader.

• **Middle**

The main results of the research follow the introduction and appropriate background. At this point, the writer must determine the depth and logical structure or the article. The depth first depends on the overall format: how much space do you have? The depth must also consider the audience’s interest, technical level, and purpose. One example of purpose in class was being persuasive; in this case withhold the conclusion until you have presented your case. Next, it is important to consider the logical progression of the middle section, which should lead to the conclusion. Alley recommends choosing an appropriate strategy based on both the subject material and the audience. There are many strategies in scientific writing, some of which include chronological, spatial-flow, and cause-effect. Alley emphasized the importance of dividing up the steps or flow in the work into groups of twos, threes or fours, but no more than that; otherwise readers lose track. The key to a good strategy is to make sure it is appropriate for the audience, and that it smoothly leads the audiences through the main areas of emphasis. Headings help the audience follow the strategy of the paper. Headings must follow the logical strategy of the paper, and to be useful, they should have a consistent grammatical structure.

In the class, we skipped over the conclusion section. The writer should finish up the paper with a concluding statement, nearly always required for journal articles. The summation of the results, expectation for future research, and how the work fits into the big picture should be addressed. According to Alley, the conclusion should be about 5-10% of the whole paper. It should be similar to the opening summary, and structured similarly, as repetition brings home the key points.

Key takeaways in the conclusion:

- Go into more depth on the results and recommendations, than in your summary
- Convey sense of closure
- Provide future perspective

Chapter 3 shows that even if the work is well organized (intro, middle, conclusion), the audience can lose track if the paper lacks smooth transitions, depth and emphasis. Proper transition sentences repeat headings, they begin with background material, and move the audience from one topic to the next. Poor transitions overwhelm the reader with new information, and can raise the audiences’ expectations too
high for the punch line to be effective. Avoid “empty” beginnings where the first sentence loses an opportunity to inform, “in media res” beginnings where details are too specific, and “Genesis” beginnings which are too general.

In the class, we did not have to go into depth, on the topic of depth. The main point here is that the audience will quickly lose interest if the depth of the paper is inappropriate for the audience, or too detailed for the structure/format.

**Emphasis**

If the writer fails to emphasize the main point(s) of the paper, then the audience will not be able to discern what the key messages actually are. In class we discussed some ways that emphasis can be accomplished:

- **Repetition** (Not equal to redundancy),
  - Necessary for emphasis
  - Reminds the reader of the key points writer wants to make

- **Wording**
  - Structure a sentence to show the importance of each clause

- **Illustration**
  - Use a figure to emphasize key takeaways

- **Placement**
  - Put important things adjacent to white space (i.e. end or beginning of
  - Contrast short and long paragraphs and sentences
  - Don’t overemphasize too many points (i.e. long lists)

Awesome Alley Quote:

“Placing important information in the wrong place can greatly reduce the chances that the audience will remember that information. For instance, many scientists and engineers bury important details in the middle of paragraphs.”

We ended the class with a review of two abstracts from non-native speakers. The task here was to identify how some of the main points made in Ch 1,2,3 manifest in non-native writing, because the writing styles tend to lack some of the consistency/organization/structure/emphasis/parallelism discussed by Alley. The process was challenging due to some blacked-out text., Class participants thought that restructuring the abstract into an order that made sense was the first step. The second step would be reviewing the abstract to improve the emphasis, depth, and transitions between the main points.

**Reference**