

The Craft Of Scientific Writing

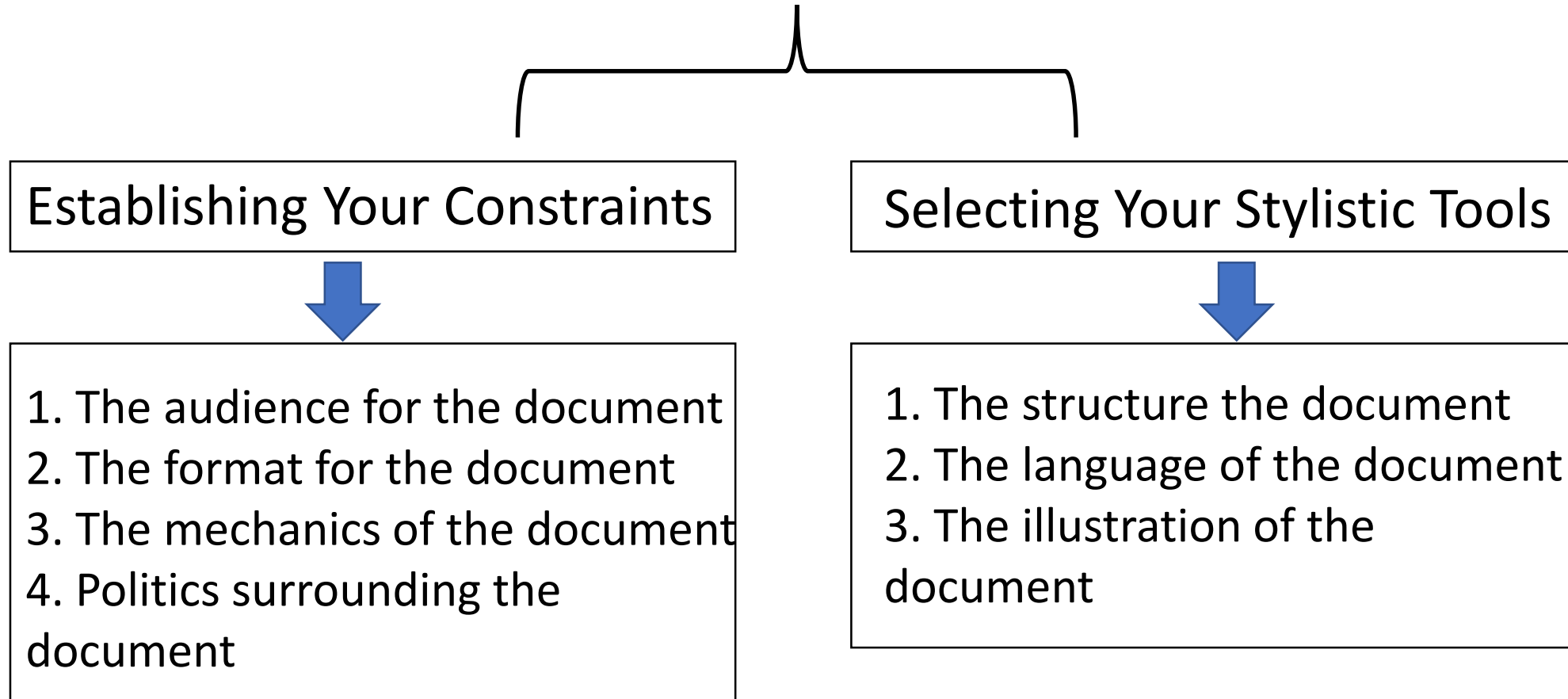
Part 1

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Introduction: Deciding Where to Begin



Establishing Your Constraints

Audience:

Defining your audience is the place to start writing the documents.

Key word is “Efficiency” : a style that communicated the most amount of information in the least amount of reading time.

Ask four questions:

1. Who will read the document?
What type of reader you have.
2. What do they know about the subject?
How much your audience know about the document.
3. Why will they read the document?
What information the audience is seeking in the document
4. How will they read the document?
The audiences will read the document in which manner.

Format:

The typeface used

The way the pages are numbered

The way source are referenced

The length of the document

Mechanics:

Grammar and punctuation

Politics

Remain honest

Selecting Your Stylistic Tools

Structure:

The organization of detail

The depth of the detail

The transitions between detail

The emphasis of detail

Illustration:

presenting of figures and table

Meshing of figures and tables

Language:

Choice of words

Arrangement of words

The use of numbers, equation, and abbreviations

The use of examples and analogies

Be precise

Be clear

Be forthright

Be familiar

Be Concise

Be fluid

Structure: Organizing Your Documents

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graph TD; A[Structure: Organizing Your Documents] --> B[Beginnings of Documents]; A --> C[Middles of Documents]; A --> D[Endings of Documents]; B --> B1[1. Creating Titles]; B --> B2[2. Writing Summaries]; B --> B3[3. Writing Introductions]; C --> C1[1. Choosing an Appropriate Strategy]; C --> C2[2. Creating Sections and Subsections]; D --> D1[1. Writing Conclusion Sections]; D --> D2[2. Writing the Back Matter];
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Beginnings of Documents

1. Creating Titles
2. Writing Summaries
3. Writing Introductions

Middles of Documents

1. Choosing an Appropriate Strategy
2. Creating Sections and Subsections

Endings of Documents

1. Writing Conclusion Sections
2. Writing the Back Matter

Beginnings of Documents

Creating Titles

Red= wrong

Blue= right

Title:

The title is the single most important phrase of a scientific document

It identifies the field of study for the document

Effects of Humidity on the Growth of Avalanches

Effects of Humidity on the Growth of Electron Avalanches in Electrical Gas Dischargers

It separates the document from all other documents in that field

Studies on the Electrodeposition of Lead on Copper

Effects of Rhodamine-B on the Electrodeposition on Lead on the Copper

An audience can absorb only three or four details

Effects of Rhodamine-B and Saccharin on the Electric Double Layer During Nickel Electrodeposition on Platinum Studied by AC-Cyclic Voltammetry on the Copper

Use of AC-Cyclic Voltammetry to Study Organic Agents in the Electrodeposition of Lead on Copper

Use small words to couple big words

10MWe Solar Thermal Electric Central Receiver Barstow Power Pilot Plant Transfer Fluid Conversation Study

Proposal to Use a New Heat Transfer Fluid in the Solar One Power Plant

Avoid phrases that your audience will not recognize

Use of an IR FPA in Determining the Temperature of a Face

Determining Temperature Gradients With a New Infrared Optical Device

Writing Summaries

A descriptive summary tells readers what kind of information the document will contain.

This paper describes a new inertial navigation system for mapping oil and gas wells. In this paper the mapping accuracy and speed of this new system are compared against the mapping accuracies and speeds of conventional systems.

An informative summary present the actual results of the work.

This paper describes a new inertial navigation system that will increase the mapping accuracy of oil wells by a factor of ten. The new system uses three-axis navigation that protects the sensors from high spin rates. The system also processes its information by Kalman filtering (a statistical sampling technique) in an on-site computer. Test results show that the three-dimensional location accuracy is ± 0.1 meters of well depth, an accuracy ten times greater than conventional systems.

Besides mapping accuracy, the inertial navigation system has three other advantages over conventional systems. First, its three-axis navigator requires no cable measurements. Second, probe alignment in the borehole no longer causes an error in displacement. Third, the navigation process is five times faster because the gyroscopes and accelerometers are protected.

Writing Introductions

What exactly is the work?

Why is the work important?

What is needed to understand the work?

How will the work be presented?

Don't assume that your introduction must explicitly address all four questions. Depending on the work and the audience, your introduction may address only two or three of the question

Your introduction is your first chance to define the full boundaries of your work, and it's an opportunity to show why your work is important. Another question that reader expect an introduction to answer is really a question of what background information the introduction provides.

Middles of Documents

Choosing an Appropriate Strategy

1. chronological strategy, which follows the variable of time.
2. spatial strategy which follows the physical shape of a form or object
3. To follow the flow of some variable, such as energy or mass, through a system.

For each document, you should tailor a strategy that is appropriate for the subject matter and the audience. Tailoring a strategy is often a trial-and-error process. You envision a path, you try it, and then you look back to see whether it works for your subject matter and audience.

Creating Sections and Subsections

Sections and subsections show readers the strategy of the document.

Sections and subsections also provide readers with white space.

Sections and subsections allow readers to skip information that does not interest them.

You should strive for the same clarity and precision that you have attained in the title of a document.

Slurry

Combustion

Pollution

Dry

Combustion

Pollution

Coal-Water Slurry

Combustion Efficiency

Combustion Emissions

Dry Pulverized Coal

Combustion Efficiency

Combustion Emissions

You should also consider the parallelism of the titles.

Mining the Coal

Transportation Stage

Burning the Coal

Mining Stage

Transportation Stage

Combustion Stage

Mining the Coal

Transporting the Coal

Burning the Coal

If you break your information into one subsection, you must have a second.

Endings of Documents

Writing Conclusion Sections

- 1. presenting an analysis of the key results**
- 2. In the conclusion's analysis, you treat the results as a whole, rather than individually as you did in the discussion.**
- 3. give a future perspective on the work.**

In some documents that future perspective might be recommendations.

In other documents that future perspective might be a nod to the direction in which your research will head.

A third kind of future perspective is to mirror the scope and limitations that you presented in the beginning of the document.

What's the difference between a conclusion on and an informative summary?

Sometimes, very little. However, a conclusion addresses an audience that has read the document, while an informative summary does not. Because of this difference in audience, a conclusion gives you the chance to go into more depth on the results and recommendations.

Writing the Back Matter

1. You write appendices to give additional information to secondary audiences.
2. Another type of appendix is one having detailed information for a more technical audience.
3. A third kind of appendix is one that presents branch information.
4. A glossary is a special appendix that gives background definitions to secondary audiences.

Transitions Between Details

A disadvantage of using sections is that they make inherent discontinuities in the reading. Two ways to overcome these discontinuities between sections are to map the sections and to smooth the entrances into the sections.

Mapping sections: When you divide a discussion into sections, you seek divisions that are logical and appropriate for the audience.

The simplest way of mapping section is to present the names of the sections in a list just before the sections occur.

Dangers of Breathing Compressed Air

Recreational scuba divers breathe compressed air at depths down to 190 feet. Breathing compressed air at these great depths and even at more moderate depths poses many dangers for scuba divers. These dangers are nitrogen narcosis, decompression sickness, and arterial gas embolism.

Besides using mapping to show readers the divisions in a document, you also make transitions by smoothing the entrances into sections.

There are three common beginnings to a section that you should **avoid**.

1. "empty" beginning

The behavior of materials in combustion systems has considerable technological significance.

2. "in medias res" beginning

Item 12 on Drawing XLC-3549 shows the tolerance of the safe adapter.

3. "Genesis" beginning

Man has since the beginning of time attempted to acquire a greater and greater control over his environment. Gaining control over a situation serves not only a survival related need, but also a psychological need. Man's need for better control of his environment has increased greatly during and following any time of major conflict, such as World War 11. This need and desire for control is evident in all technological settings, including the **welding field**.

The straightforward repetition of the heading is the most common way to begin a section or subsection.

Precombustion Processes. Precombustion processes for reducing emissions of sulfur dioxide occur before the coal is even burned. There are two major types of precombustion processes: coal switching and coal cleaning.

You can begin with background information and then focus on the subject of the section.

Downhole Steam Generator. More than half of the oil in a reservoir is too viscous to pump out with conventional methods. By heating these oils with steam and decreasing their viscosity, we can recover billions of gallons. For oils below 800 meters, the steam produced on the surface loses too much energy in transit to heat the oil. One way to overcome this problem is to use a downhole steam generator that applies hot steam directly.

Depth of Details

1. Depth depends on format.
2. The interest of the audience in the subject affects the depth.
3. The technical level of the audience affects the depth
4. the purpose of the document affects the depth

Depth 1: The Environmental Protection Agency has tightened emission standards by 60 percent.

Depth 2: The Environmental Protection Agency has tightened emission standards from 0.25 g/hp-h to 0.1 g/hp-h.

Depth 3: The Environmental Protection Agency has tightened emission standards from 0.25 g/hp-h (grams of particulate/horsepower-hour) to 0.1 g/hp-h. The particulates include hydrocarbons, carbon monoxide, and nitrogen oxides. All three particulates are considered pollutants.

Emphasis of Detail

Lack of emphasis is probably the most common structural problem in scientific writing.

Emphasizing Details with Repetition.

Repeating important results in a document is not being redundant.

Studies show that people remember only about 10 to 20 percent of what they read.

The typical organization of most scientific documents gives you the opportunity to use repetition.

Summary- first time

Discussion of the work- second time

Conclusion- third time

Emphasizing Details with Wording.

Many details in scientific documents float, ungrounded, because the author has not shown why the details have been included:

One of the panels on the north side of the solar receiver will be repainted with Solarcept during the February plant outage.

Prepositional phrases list details, but do not give details any relative emphasis.

In strong scientific writing, the writer anchors the details by giving reasons for their inclusion:

Because the February plant outage gave us time to repair the north side of the solar receiver, we repainted the panels with Solarcept, a new paint developed to increase absorptivity.

Emphasizing Details with Illustration.

Although scientific readers don't read every sentence, they almost always look at every illustration.

If you can place important results in an illustration, do so.

Emphasizing Details with Placement.

Text that borders white space receives more emphasis than text that borders other text.

The titles and headings receive emphasis.

The beginnings and endings of sections (paragraphs) also receive emphasis.

You can also use the lengths of sentences and paragraphs.

A short sentence following a long sentence receives emphasis.

A short paragraph following a long paragraph receives emphasis.

This report uses data from both the test and evaluation and power production phases to evaluate the performance of the Solar One receiver. Receiver performance includes such receiver characteristics as point-in-time steady state efficiency, average efficiency, start-up time, operation time, operations during cloud transients, panel mechanical supports, and tube leaks. Each of these characteristics will be covered in some detail in this report.

This report uses data from both the test and production phases to evaluate the performance of the Solar One receiver. In this report, we will evaluate performance by studying the receiver's efficiency, operation cycle, and mechanical wear.

Thanks

To be continue