

## Conventions of Science Writing

The purpose of science writing is to accurately communicate observations and analyses and their importance in a way that will convey a sense of context to the reader and possibly allow for repeatable experiments. Science writing demonstrates both the expertise and objective stance of the writer and is marked by a style that is clear, concise, and accurate.

### Demonstrating expertise and objectivity

- **Emphasize facts and observation**

Science writing often relates to experimentation and contributes to building a body of knowledge, so its primary focus is on facts and conclusions drawn from careful observation, not opinion. Conclusions should be directly supported by the data presented and/or by others' research.

- **Use technical language appropriately**

Science writers should be aware of the level of expertise of their audiences in order to determine what technical language to use. If the audience consists of readers in the same field, then technical terms common to the discipline should be used to refer to familiar theories, processes, and practices, and to achieve conciseness. If the audience is general, technical terms should be avoided or clearly explained.

- **Write with a formal tone**

Science writing uses a formal tone that is consistent with its emphasis on the research rather than the researcher. Writing is free of contractions, colloquialisms, and informal language, and often uses the passive voice and/or the active voice in a limited way.

### Passive Voice

The passive voice emphasizes the object receiving the action rather than the actor performing it.

*The samples were diluted with 100 ml of H<sub>2</sub>O.*

Here the subject (samples) receives the action of the verb (to dilute). While the passive voice has been commonly used in science writing, the practice is changing in many disciplines because the passive voice can produce wordy, awkward sentences and because there is a growing acknowledgment of the role of the researcher in the scientific process.

While use of the passive voice is giving way to more active, dynamic writing in the sciences, the passive voice may still be appropriate (and required), particularly in lab reports in the Methods and Results sections and/or in the Abstract.

### Active voice

The active voice places the actor performing the action at the beginning of the sentence.

*The researcher diluted the samples with 100 ml of H<sub>2</sub>O.*

Here the subject (researcher) performs the action of the verb (to dilute) on the object (samples). There are a number of ways to use the active voice in science writing without using the first-person “I.” Use the following alternatives to “I” as the subject of active-voice sentences:

*We – We modify the above model as follows.*

*A figure, table, or section – Figure 1 illustrates...; The introduction highlights that...*

*Results of studies – Experimental evidence shows that...*

*A technique or procedure – PCR analysis produced clones...*

*The researcher(s) – Jones and Martin (2010) found that...*

When in doubt about whether active or passive voice is expected or required, consult articles in your field for guidance or check with course instructors or supervisors.

- **Avoid unsupported definitive conclusions**

To support an objective stance, it is important to acknowledge limitations by explaining results in a way that allows for a degree of uncertainty. Thus, results *suggest*, *indicate*, or *are significant* rather than *prove*. If you use somewhat definitive statements, be sure to back them up with evidence.

## Writing clearly

- **Organize material effectively**

If you indicate an order for your sections early in your paper or report, it is important to maintain this order throughout so your reader can progress easily through your document.

- **Use plain language**

To balance necessary technical terminology, science writing should be in plain, direct language.

Not *utilize* but *use*

Not *elucidate* but *explain*

Not *modification* but *change*

Not *determinant* but *cause*

Not *systematize* but *order*

Not *numerous* but *many*

- **Include short sentences**

It is important in science writing to avoid overly complex sentences that include too many ideas or too much information for the reader to process. Short sentences convey information in a manageable way; combined with longer sentences, they also contribute to an interesting style. Further, sentences that begin with the subject and verb deliver meaning to the reader most efficiently.

**Not** *As either a direct modifier (PPA) or a blowing agent (PPA or H<sub>3</sub>PO<sub>4</sub>), phosphoric acid is a likely cause of the excessive ageing in Site A because it is known to gel asphalt cement, which leads to reduced stress relaxation, increased thermal stresses, and increased levels of cracking distress.*

**But** *Phosphoric acid, as either a direct modifier (PPA) or a blowing agent (PPA or H<sub>3</sub>PO<sub>4</sub>), is a likely cause of the excessive ageing in Site A. This agent is known to gel cement, which leads to reduced stress relaxation...*

- **Watch your verb tenses**

Use appropriate tenses for various purposes in science writing to clarify progression:

To discuss concepts or generally occurring processes, use the **present tense**.

*Cellular replication involves one cell dividing itself into two identical copies.*

To describe what you or someone else did or asserted (particularly in the Methods and Results sections of lab reports), use the **past tense**.

*We observed that the inclusion of the N-protonated and N-alkylated guests within the CB[7] cavity caused the normally rapid chair/chair interconversions to become sufficiently slow ...*

To present a plan for a proposal, thesis, or article, use the **present** or **future tense**.

*In the next section we (will) state and put into context previously published dynamical models of telomere shortening.*

## Writing concisely

- **Avoid wordiness**

To eliminate wordiness, try these strategies:

**Substitute a single word for a phrase**

*Not due to the fact that* but *because*

*Not at this point in time* but *now*

**Use simple, active verbs instead of verb phrases**

*Not make an assumption* but *assume*

*Not come to a conclusion* but *conclude*

- **Use abbreviations when appropriate**

For conciseness, replace frequently used terminology with abbreviations. After the first use of a term, identify the abbreviation in parentheses and use it thereafter.

## Writing accurately and precisely

- **Use accurate word choices**

It is important to use the most accurate wording possible in science writing, even if repetition is the result. A precise, accurate word that is repeated is better than a somewhat ambiguous, less precise substitution.

Frequently misused words: *data* (this word is always plural, as in *data are collected*), *criteria* (this word is also plural; *criterion* is the singular), *affect/effect* (*affect* is a verb meaning *to influence*; *effect* is usually used as a noun meaning *result*)

**\*Definitions:** a ***hypothesis*** is a possible explanation for what causes something to occur (e.g., wasps find their burrows using landmarks); a ***prediction*** is an expected result that should be observed if the hypothesis is true – a pattern in the collected data (e.g., if the above hypothesis is true, then moving the landmarks should cause wasps to go to a different place).

A ***study*** usually means an observational study in which researchers observe subjects and measure variables but do not assign subjects to treatments or manipulate them in any way. In an ***experiment***, researchers control/manipulate the primary variables and usually assign subjects to treatments.

- **Be sure your writing is detailed**

Science writing should provide enough detail about the context and purpose of the research that the reader knows why the study is important and interesting. Materials and methods should be described specifically enough for someone else to repeat an experiment. Detailed writing in the analysis will show the chain of logic used to draw conclusions from the data.

*With guest 2, we observed the splitting of two of the methyl resonances, which suggests that these positions are sensitive to binding of both the 1:1 and 2:1 complexes.*

While writing with sufficient detail is important, it is also important to include only information and description that is relevant to the purpose of the paper.

- **Include quantitative rather than qualitative observations**

In describing the results, use specific, concrete wording rather than vague, qualitative language:

**Not:** *The section of road north of Highway 33 had some transverse cracking in addition to some minor wheel path cracking.*

**But:** *The section of road 9.5 km north of Highway 33 had two transverse cracks, both a quarter lane wide, in addition to 19.8 m of minor wheel path cracking.*

Avoid using modifiers such as *much*, *very*, and *really* because they are subjective and imprecise.

**Note:** use the modifier *significant* carefully and accurately – in science writing, a result is significant if it is **statistically significant**.

## A note on referencing

Science writing does not generally include direct quotations from sources because what is said is considered more important than how it is said. Instead, information is summarized or paraphrased in the writer's own words and cited using one of a number of styles of documentation. To determine which style to use, observe the references of journal articles in your field for direction.

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