

The Language of Biological Engineering Reports

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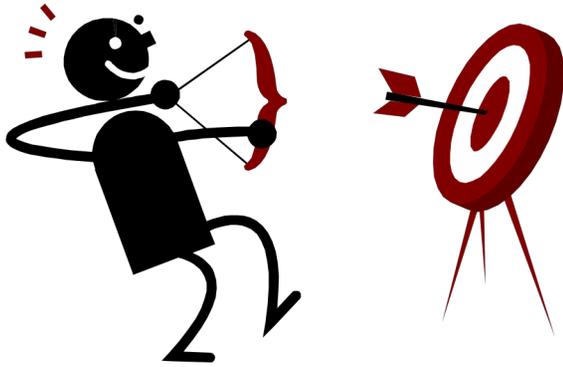


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Key topics

- ▶ **Meeting scientific language goals**
- ▶ **Eliminating jargon**
- ▶ **Addressing mechanical matters**
- ▶ **Being brief**



Meeting Scientific Language Goals

Accuracy and accessibility

Accuracy

▶ **Deliver objective data and ideas accurately**

- Concise description of context, including theory
- Forecast of expected results
- Clear sketch of methodology and experimental setup
- Explanation of results
- Discussion of findings

▶ **Discuss your analysis of the results accurately**

- Explain what you think about your findings
- Convey sense of discovery to the reader

Accessibility

▶ **Analyze potential readers for your report**

- Assume broader readership than fellow 20.109 students
- Make reports accessible to the broad scientific community
- Remember that readers may include generalists or professionals from other fields with partial knowledge of the field and your work

▶ **Respect expertise of multidisciplinary readers**

- Understand what the various categories of readers bring with them when they read your report
- Recognize that making a report broadly accessible is NOT “dumbing it down”



Eliminating Jargon

"The greatest possible merit of style is, of course, to make the words absolutely disappear into the thought"

Nathaniel Hawthorne qtd. in Alley, 128

Beware of word choice

▶ Use concise, concrete words readers understand

- Test wording
- Keep it simple (KIS)
- Use *Webster's Dictionary* to check nouns converted to verbs
- If you are unsure whether your readers will understand an expression, define it in the text, a footnote or a glossary

▶ Define acronyms on first mention

- Spell out the entire expression, capitalizing proper nouns and adjectives
- Put the acronym in parenthesis after the full expression
- After defining an acronym, use it

How did you reword and why?

- ▶ The bovine was postoperatively traumatized by a defective electrified feeding enclosure, necessitating euthanization.
- ▶ Positionize the slide carefully to visualize the quite unique spatial configurations with a high degree of accuracy.
- ▶ It is the author's opinion that it is not unjustifiable assumption that this chemotherapeutic agent has the capability of significantly ameliorating and attenuating the symptomology of the disease process.



Addressing Mechanical Matters

English grammar is dynamic because the language is alive

How did you repair and why?

- ▶ Indicate optimum instrument settings for temperature humidity rainfall and performance.
- ▶ When examined closely the skeleton bears many bumpy spines, that project from the surface of the animal.
- ▶ Class Enchinoidea which includes sea urchins sand dollars and heart urchins is not closely related to class “Ascomyceteae.”
- ▶ The adults are radially symmetrical but the larvae are bilateral and it is generally held that this phylum evolved from bilateral ancestors and that radical symmetry arose as an adaptation to a sessile way of life.
- ▶ The essay, The Future of Veterinary Medicine, appeared in the early 1960’s.

Verbs and technical reports

Past

Present

Future

► Present tenses

- **Simple present:** action takes place now or is habitual: i.e., the theory behind scientific work
- **Present progressive:** action ongoing right now
- **Past present:** action that started in the past and is repeated in the present or that just ended
- **Past present progressive:** action has been ongoing since a past time

Verbs and technical reports

▶ Past tenses

- **Simple past:** a discrete action that started and ended in the past: commonly used for your experimental methodology and setup as well as your results
- **Past progressive:** action has been ongoing since a past time
- **Past perfect:** If two discrete past actions were sequential, the first belongs in the past perfect
- **Past perfect progressive:** action took place continuously before another past action

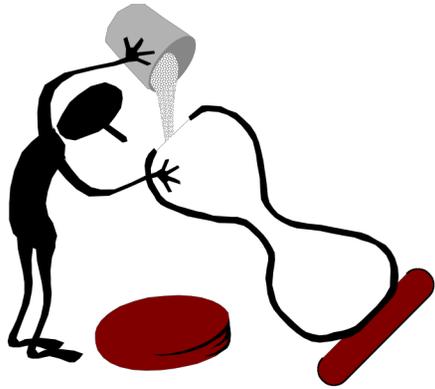
▶ Future tenses

- **Simple future:** action that is predicted: less common in technical writing

Thoughts on proofreading

- ▶ Really hard because it is tedious, perhaps even boring
- ▶ Use, but do not overuse, the software
 - Works best for binary issues
 - Find mistakes and then search for them
 - Be very judicious in taking software grammar advice
- ▶ Do not leave proofreading for late at night
- ▶ Always proofread from a print out





Being Brief

"...brevity is the soul of wit ..."

Polonius to King Claudius and Queen Gertrude, Shakespeare's *Hamlet*, II.ii.90

Readability and brevity go hand-in-hand

- ▶ The Flesch Readability Scale (FRS) quantifies what makes a text easier to read
- ▶ FRS =
 - $206.835 - (1.015 \times \text{ASL}) - (84.6 \times \text{ASW})$
 - *Where*
 - ASL is average sentence length in words
 - ASW is average syllables per word

Flesch Reading Ease Score	Readability Level
0-29	Very Difficult
30-49	Difficult
50-59	Fairly Difficult
60-69	Standard
70-79	Fairly Easy
80-89	Easy
90-100	Very Easy

See “Flesch Reading Ease Readability Score.” Technology Evaluation.com. February 2010.

How did you reword and why?

- ▶ The authors envision that approximately 20-30 steps which are collectively referred to as electrophoresis will be necessary in the majority of cases.
- ▶ Figure 1. The lateral white cells as they have been shown to appear in a living abdominal ganglion of a cockroach. The ventral view has the anterior at top. The scale bar is 0.1 mm.
- ▶ The total absence of visible color was absolutely unique.
- ▶ To determine the mobility activity of the organism, new state-of-the-art equipment was used.
- ▶ For a full and complete understanding of the impacts and ramifications of the hot temperature upon the organism, it is our personal opinion that future plans should include a chilling procedure.

How did you reword and why?

- ▶ The kidney is a very important organ. It has the ability to secrete substances selectively. This makes it able to maintain proper composition of the blood and other body fluids. The various end products of metabolism are injurious if allowed to accumulate.
- ▶ Sex-linked genes explain red-green color blindness in man, and if a woman **heterozygous** for color blindness marries a normal-visioned man, all of the daughters of this combination will have normal vision, but half of the sons will be color blind; however, half of the daughters will be heterozygous for the defect but the normal sons will show no trace of the anomaly and will never transmit it to their children; while the heterozygous daughters can have color blind sons, the homozygous daughters will never pass the trait on to their sons and daughters.
 - Notes: Webster calls this the adjective form of heterozygote, “a plant or animal having two different alleles at a single locus on a chromosome and hence not breeding true for the particular character involved; hybrid.”

How did you reword and why?

- ▶ **Abstract:** In order to further understand the mechanism by which the **kinasing** region of EnvZ protein functions, and more broadly the family of **histidine** kinases that share such conserved regions, the optimization of a Bacterial Photography System was pursued through the selection of mutants of a fusion Cph1-EncZ protein that exhibited increased Kinasing activity. Characterization of the amino acid changes causing the K⁺ phenotype revealed steric and electrostatic influences of mutations in key residues that could be responsible for the ultimate increase in **betagalactosidase** activity, or more broadly, the system's output signal.
 - Notes: Webster views kinase as a noun without verb or adjective forms, “an enzyme capable of activating a zymogen or one causing the transfer of the terminal phosphate group, generally from ATP (defined by Webster as a nucleotide, C₁₀H₁₆P₃O₁₃N₅, present in and vital to the energy processes of all living cells) to a receiving molecule.”
 - Webster views histidine as a noun without verb or adjective forms, “a nonessential amino acid, C₃H₃N₂CH₂CH(NH)₂COOH, that is essential for growth in infancy.”
 - betagalactosidase: Not explicitly defined in Webster

More help

- ▶ Alley, Michael. *The Craft of Scientific Writing* (New York, Springer-Verlag, 2008).
- ▶ Associated Press. *The Associated Press Stylebook 2009*. 1977 44th ed. Ed. Darrell Christian, Sally Jacobsen and David Minthorn (New York: Basic Books, 2009). See also apstylebook@ap.org.
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- ▶ Perelman, Leslie C., James Paradis and Edward Barrett. *The Mayfield Handbook of Technical Scientific Writing* (London: Mayfield Publishing Company, 1998).
- ▶ Strunk, William, E.B. White and Charles Osgood (Afterword). *Elements of Style*. 1959 4th ed. (New York: Longman, 2000).
- ▶ Tufte, Edward R., *Envisioning Information*, Cheshire, CT: Graphics Press, 1990.
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