The Language of Biological Engineering Reports

Linda L. Sutliff, BA, MA, MBA
Lecturer, Writing across the Curriculum

With special thanks to Agi Stachowiak, Neal Lerner and Atissa Banuazizi

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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?

Text examples removed due to copyright restrictions.

See Exercise 7-1(C) "Jargon" (p. 144) in Matthews, J. R., J. Bowen and R. W., Matthews. *Successful Scientific Writing: A Step-by-Step Guide for the Biological and Medical Sciences*. 2nd ed. New York, NY: Cambridge University Press, 2000. [Preview in Google Books]

Addressing Mechanical Matters

English grammar is dynamic because the language is alive

How did you repair and why?

Text examples removed due to copyright restrictions.

See Exercise 8-1 "Punctuation" (p. 172) in Matthews, J. R., J. Bowen and R. W., Matthews. *Successful Scientific Writing: A Step-by-Step Guide for the Biological and Medical Sciences*. 2nd ed. New York, NY: Cambridge University Press, 2000. [Preview in Google Books]

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 discreet 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, Shakepeare'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 X ASL) - (84.6 X 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?

Text examples removed due to copyright restrictions.
See Exercise 5-6 "Revising for Brevity" (p. 118) in Matthews, J. R., J. Bowen and R. W., Matthews. *Successful Scientific Writing: A Step-by-Step Guide for the Biological and Medical Sciences*. 2nd ed. New York, NY: Cambridge University Press, 2000. [Preview in Google Books]

How did you reword and why?

Text examples removed due to copyright restrictions.

See Exercise 5-3, "Readability" (p. 110) in Matthews, J. R., J. Bowen and R. W., Matthews. *Successful Scientific Writing: A Step-by-Step Guide for the Biological and Medical Sciences.* 2nd ed. New York, NY: Cambridge University Press, 2000. [Preview with Google Books]

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, $C_{10}H_{16}P_3O_{13}N_5$, 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, $C_3H_3N_2CH_2CH(NH)_2COOH$, that is essential for growth in infancy."
  - betagalactosidase: Not explicitly defined in Webster

Abstract sample courtesy of anonymous MIT student. Used with permission.

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).
- Flesch, Rudolph, Abraham Herald Lass and A.H. Hass. *Classic Guide to Better Writing* (New York: HarperResource, 1996).
- 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.
- Tufte, Edward R., *The Visual Display of Quantitative Information*, 2nd Ed., Cheshire, CT: Graphics Press, 2001.

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