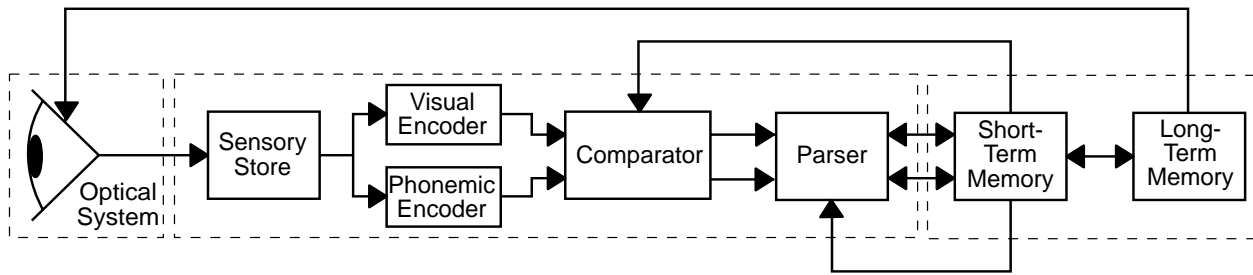


# Applying Silent Speech to Technical Communication

## INTRODUCTION

When people read silently, they unconsciously translate what they read into a speech-like code that facilitates word identification and the creation of meaning [1], as the reading model in Figure 1 shows. This article applies that phenomenon—known as silent speech—to technical communication based upon the published research of cognitive psychologists and psycholinguists.



*Figure 1. A phonological model of the reading process*

## INTRODUCING NEW WORDS

Essentially, technical writing is about conveying new information, and often such information contains terms unknown to the reader. Some unknown words can be easily pronounced because they have familiar spelling patterns, which become the rule for pronunciation for readers encountering new words [2]. Some new words are simply new combinations of words and affixes we already know and can readily pronounce. Some new words confound the speech instinct.

Because the speech instinct is so strong during silent reading, languishing over the pronunciation of a word pulls the reader from the text. Also, according to the results of

experimental investigations, people do not integrate novel words into their vocabularies until the word is heard or translated into a phonological code [3]. Therefore, pronunciation of new words is essential to understanding, especially the understanding of “difficult, infrequent, or unfamiliar material” [4, p. 241].

Because spelling and sound only roughly correspond in English, a reader left on his own to pronounce an unknown word may integrate the word into his vocabulary with the right spelling but the wrong pronunciation. As an illustration, pronounce the nonce word *mough*. Did you pronounce it like *through? cough? bough? rough? dough? trough?* All six of those words can be used analogously to pronounce the nonce word *mough*. So which is right? In this case, it is up to the writer to make the decision for the reader: “*mough* (pronounced like *cough*).”

#### ABBREVIATIONS

Much of technical writing these days is replete with abbreviations of one type or another. Some texts look like alphabet soup when held at arm’s length. Yet we would all agree that abbreviation is an indispensable way of transforming the sprawling polysyllabic jargon of science and industry into packages that the reader can manage. However, technical writers are sometimes too quick to condense such jargon without giving thought to the way abbreviations are picked up during the reading process.

For example, gardeners pronounce the abbreviation “15-15-15” as “triple-fifteen.” This creative approach to pronouncing the otherwise awkward, monotonous 15-15-15 illustrates how speakers of awkward words in a specialized vocabulary often simplify pronunciation. The problem with terms such as 15-15-15 is two-fold.

First, they are repetitive. Baddeley, Eldridge, and Lewis demonstrated how a series of repetitious sounds takes longer to process than a series of different sounds [5]. They discovered that a sentence such as “Crude rude Jude chewed stewed food” took longer to process (understand) than a sentence of equivalent semantic complexity without repetitious sounds, such as “Dark-skinned Ian ate boiled meal.” According to Williams, the way we identify meaningful parts of sentences and words “involves finding contrasts between pairs of utterances that include differences in expression” [6, p. 7]. Successive like-sounding vowels inhibit the flow of speech required for effective silent reading. Speakers tend to understand this notion. They do not pronounce “NAACP” en-ay-ay-see-pee; they say en-double-ay-see-pee. They do not pronounce “IEEE” eye-ee-ee-ee; they say eye-triple-ee. They do not pronounce “SCSI” es-see-es-eye; they say skuh-zee, inserting a schwa in the middle to render an acronym from an initialism. Illustrating a simpler way to pronounce otherwise dissonant initialisms is a good way to bring the reader closer to the text.

The second problem with terms such as 15-15-15 is that they are monotonous. When initialisms contain more than a few letters, they tend to inhibit any rhythm a sentence may have. Most consonants when pronounced by name either end in /ee/ (b, c, d, g, p, t, v, and z) or begin with /e/ (f, l, m, n, s, and x). Initialisms containing more than a few contiguous consonants can obstruct the flow of words. Consider the staccato CTGTS, which stands for cradle-to-grave tracking system. The first four consonants all have the same trailing /ee/ sound. The trick here is to recognize the staccato nature of the initialism and revise it based upon the need of the reading process to move items quickly from visual sensory store to short-term memory. Shortening it by removing unnecessary letters will help (CGT), but instilling a new term with a familiar spelling pattern will be even better (Crave, for instance).

Sometimes, what *appears* to be a correct use of an initialism—that is, what conforms to a prescriptive grammar—does not *sound* correct. Take this sentence: “A RC filter enabled the clock to keep accurate time.” It appears correct, but does not sound correct. The problem here is a misapplication of the rule for the indefinite article. The rule for selecting *a* or *an*, as I have heard and sometimes read it, depends upon the succeeding letter. If the letter that follows the indefinite article is a consonant, then use *a*; if a vowel, use *an*. Understand, however, that the rule is not bound by visual information (printed words) but phonological information (spoken words). The rule is properly stated: If the *sound* of the letter that follows the indefinite article is a consonant, then use *a*; if a vowel, use *an*. Bolinger noted that “multiple consonants and multiple vowels are harder than alternating vowels and consonants” [7, p. 39], which may be the *raison d’être* of the two forms of the indefinite article.

The same reasoning can be applied to initialisms beginning with the vowel *u*, which is pronounced /yoo/, as in USDA. Instead of taking *an*, as it would when used in a word, the vowel *u* takes *a* when used at the beginning of an initialism.

## PUNCTUATION

The mechanics of language can be expressed in two ways. Speech expresses mechanics by tonal inflections and, more rarely, pauses. The rise and fall of the speech stream determines the mechanical relationships between words in a sentence and between sentences themselves.

The other way to express mechanics is through punctuation. Most punctuation marks directly correspond to a speech phenomenon, whereas other marks are more intellectual than phonetic. Terminal punctuation marks (period, question mark, and exclamation point) correspond directly to undulations of voice pitch. For instance, Bolinger says that the natural untensing of the vocal

cords indicate the end of a complete thought [7]. A descending pitch signals the end of a declarative sentence, whereas an ascending pitch signals the end of an interrogative sentence. Semicolons, em dashes, and slashes are examples of intellectual punctuation marks, which indicate complex relationships between written words, phrases, or clauses that cannot be conveyed through ordinary speech. Here are some suggestions for applying a few of the most troublesome punctuation marks to accommodate silent speech.

### *The Comma*

Although it is common practice, omitting a comma after an introductory element can create confusion. The very thing that makes such commas unnecessary in the mind of the writer makes them necessary to the comprehension of the reader. The writer cannot recognize the need for a comma after an introductory element because he articulates the element as he crafts it. Meaning and articulation are fused in the writer's mind. He cannot see, or hear, that the element can sprawl into the rest of the sentence.

Here is an example of such a sentence: "As the input voltage continued to drop the output voltage finally reached near nominal." If this sentence were to come to us via speech, the speaker would indicate the end of the introductory element, "As the input voltage continued to drop," by a falling pitch. As it is written, however, it sprawls into the rest of the sentence. The last word in the introductory element ("drop") is often used as a transitive verb. Without a comma after "drop," the pitch of the reader's silent speech may not fall. He may therefore misread "the output voltage" as the object of "drop" instead of the subject of "reached," as I did when I first encountered the sentence. Omitting the comma created what linguists call a garden-

path sentence, which denies the reader's predictions about how succeeding words function in a sentence.

Consider another example of how omitting the comma after an introductory element can create confusion for the reader: "In this case only the subject was able to understand the command." Because the writer omitted the comma, the sentence has an ambiguous meaning that cannot be resolved without help from the writer. Does the comma go after "case," which renders one meaning, or after "only," which renders another? Does "only" modify "In this case" or "the subject"? In this case, only the writer knows.

### *The Hyphen*

To hyphenate or not to hyphenate? That is a question writers must frequently confront, often with dubious results. Ubiquitous in technical documents, the noun-string poses a difficulty for the average writer. Most writers do not even address hyphenation in noun-strings, assuming that readers are smart enough to figure out the relationship between words. However, when the reader *starts* figuring things out, he *stops* reading. Further, without hyphens to guide the reader to the correct interpretation of a word-string, consecutive nouns "can be read either as a phrase or as a compound" [8, p. 133].

Again, here is an example to illustrate the point: "The man eating fish was caught just offshore." Here, the omission of the hyphen between "man" and "eating" creates an ambiguity. Did the man who was eating fish get caught? Or did a fish that eats men get caught? Hyphenation removes all ambiguity by properly indicating the stresses of each syllable. The resulting tonal information leads the reader to the correct meaning: "mán-eating fish," not "mán éating fish." In the same vein, a "dry cleáning agent" is Ajax, whereas a "dry-cleaning agent" is

benzine. “Small búusiness woman” is a derogatory term, whereas “small-business woman” is a respectful one. “American hístory teacher” is a teacher of history who is an American, whereas “American-history teacher” is a teacher of American history. Notice that in all of the above comparisons, the unhyphenated modifiers have slightly different stress contours than the hyphenated ones.

The hyphen is often used in a way that inhibits speech. For example, in the following sentence, the hyphen conceals the relationship between the two words it joins: “Lowering line-pole grounding resistance made a real improvement.” When we read this sentence, we say “line pole” instead of “line to pole” as the writer intended. A writer may intend for a hyphen to equal *to*, but the latent word *to* is not translated into the speech code. Therefore, the reader does not make the logical connection between the two words. The same can be said about hyphens used to indicate a range, such as “20–30%.” To enable the reader’s silent speech, write “line-to-pole” and “20 to 30%.”

### *The Apostrophe*

One dubious rule for the use of the apostrophe is that only animate nouns can take an apostrophe because inanimate things cannot possess. Although apostrophes should not be used in some cases, the decision to use or not use an apostrophe plus “s” should have nothing to do with whether the noun refers to animate or inanimate things. The decision should be based upon the way the end of a noun sounds. Generally, if a singular noun ends with a sibilant (/s/, /z/, /sh/, /zh/, /ch/, /j/), the apostrophe and “s” should not be used because the /z/ of the apostrophe “s” clashes with sibilants [7]. Instead, use the word *of* to indicate possession. For example, write “Many died in the wake of the disease,” not “Many died in the disease’s wake.” Note that *The*

*Chicago Manual of Style* suggests simply using an apostrophe and omitting the “s” when the noun ends with a /z/. However, unless the noun is a proper name, the apostrophe *looks* misplaced (disease’ wake) and the possessive noun *sounds* like an unpossessive one used adjectivally (disease wake). Thus the relationship between possessor and possessed is lost.

### POLITICALLY CORRECT PRONOUNS

Readers often pay the price for a writer’s political correctness. In order to be non-offensive, writers embrace the whole of humanity with neutered contrivances. The use of the singular subjective pronouns *he* and *she* have undergone quite a radical evolution in a very short time. *He* once encompassed *she*. Then *she* gained a condescending acknowledgment, accompanying *he* inside parentheses like so: *he (she)*. Soon, *she* came out of the parentheses: *he or she*. The two danced around the slash, as in *he/she* and *she/he*. And now the two have fused to form *s/he*. The problem with *s/he*, as you might have guessed, is that the reader cannot pronounce it. In a jest that reveals the frustration of negotiating political correctness, some writers have recommended using the all-inclusive pronoun *s/h/it*.

*Merriam-Webster* now says that using *their* instead of *his* or *her* is grammatically acceptable [9]. Of course, speakers have always known that *their* is acceptable. Yet writers are often reluctant to follow the ways of ordinary speech. In some cases, however, the use of *their* is appropriate despite a prescriptive insistence on using a singular pronoun. In the sentence “Everyone returned to his/her seat,” the term “his/her” should be “their,” not because *Merriam-Webster* says but because it is classically grammatical. Consider that a pronoun must match its antecedent in number and gender. As long as the number is plural, we have no problem, which is what we have here. The antecedent of the pronoun in this case is not “Everyone” but “people.”

Where is “people”? The same place where “You” hides in the sentence “Hand me the book.”

The sentence is elliptical. The complete sentence with all of its parts—expressed and implied—is

“Everyone [of the people] returned to *their* seats.” The word “people” is the antecedent.

Therefore, it takes a plural pronoun.

The point remains that when writers wield contrivances such as s/he and his/her, they wield the sword by the blade, trading something valuable to the reader—the speech-enabling quality of a simple pronoun—for reputations as politically sensitive writers.

## AND SO ON

### *Avoid Optional Plurals*

How do you read the following sentence? “The grounding electrode(s) is a crucial element of good power quality.” We see the “s,” so we pronounce the “s.” If we get meaning from the phonological path as well as the visual path, then the word “electrode(s)” is plural. Yet the verb is singular. The parser may quickly send a red flag to the short-term memory of the reader. To fix the sentence, change the verb to match the plural subject and remove the ambiguity-causing parentheses from around the “s” in “electrode(s).” And because the sentence declares an abstraction, the optional plural does not bear upon meaning. If the optional plural bears upon the meaning of the sentence, then the meaning should prevail through careful revision or, if necessary, retaining the optional plural.

### *Put Adverbs Where They Go Naturally in Speech*

Yes, English speakers split infinitives. Unlike Latin, which has one-word infinitives, English infinitives are created from two words: *to* plus the base of a verb. Because Latin infinitives could

not be split, the English grammarians, who based our grammar upon Latin, prescribed that one should never split an infinitive. English speakers also intuitively place many adverbs between a verb and its auxiliary. We would not say, “A loop antenna also was used.” We would say, “A loop antenna was also used.” Yet, many technical writers insist upon unifying a verb and its auxiliary at the expense of satisfying the reader’s speech patterns.

### *Don't Forget the Articles*

Articles not only enable the reader to determine whether a noun is definite (the book) or indefinite (a book), but they also infuse a text with rhythm. Read these assembly instructions for a self-propelled lawnmower: “Lift idler assembly, re-attach drive gear, and insert peg into higher or lower hole in frame.” Now read the instructions re-written for rhythm: “Lift the idler assembly, re-attach the drive gear, and insert the peg into a higher or lower hole in the frame.” The text no longer sounds as if Tarzan was the principal author, and the articles act as rhythmic bridges.

## SILENT SPEECH IN THE REVISION PROCESS

Revision is not simply a process of looking for errors, looking for violations of a prescriptive grammar. Revision is a process of re-hearing as well as re-seeing. A number of times, someone has reviewed something I have written and commented about a passage, “It just doesn’t sound right.” And that’s the best kind of editorial commentary a writer can receive from a reviewer, because that’s the kind of criticism a reader will conjure when he stumbles through a passage that just doesn’t sound right.

Consider, then, proceeding with revision not from cause to effect but from effect to cause. Not only to detect errors of many sorts, but also to improve the fundamental *soundness* of a text, carefully listen to the silent speech created by the reading process. Then, monitor your reactions to that voice in your head. An adverse reaction deserves a close scrutiny of the wayward passage, as well as a fundamental question: What went wrong? As Gabbert says, “there is a way—a beautifully simple way—to obtain a reader reaction to your writing. Read it aloud; or, even better, have someone else read it aloud while you listen” [10, p. 336].

And if we are in a stage of the revision process that limits our investigation of a text to looking for errors (such as proofreading), there again silent speech is a valuable asset. As Baddeley, Eldridge, and Lewis concluded from their experimental investigations, silent speech “provides a source of information that is useful in detecting errors” [5, p. 446]. Use the speech instinct to your advantage by letting a text tell you what’s wrong.

## CONCLUSION

Writing techniques foregrounded in reading theory empower technical communicators with a genuine foreknowledge of reader reaction. Certainly readers react to the way texts sound and rely upon that sound to comprehend technical concepts. I have outlined a few ways to apply silent speech to technical communication. Other innovative applications will surely improve the readability of technical prose in more ways than I have explored in this article.

## REFERENCES

1. B. Connatser, A Phonological Reading Model for Technical Communicators, *Journal of Technical Writing and Communication*, 27(1), pp. 3–32, 1997.
2. R. Campbell and D. Besner, This and That—Constraints of the Pronunciation of New, Written Words, *Quarterly Journal of Experimental Psychology*, 33A, pp. 375–396, 1981.
3. J. Baron, Mechanisms for Pronouncing Printed Words: Use and Acquisition, in *Basic Processes in Reading: Perception and Comprehension*, D. LaBerge and S.J. Samuels (eds.), John Wiley and Sons, New York, pp. 175–216, 1977.
4. L. McCusker, M. Hillinger, and R. Bias, Phonological Recoding and Reading, *Psychological Bulletin*, 89(2), pp. 217–245, 1981.
5. A. Baddeley, M. Eldridge, and V. Lewis, The Role of Subvocalisation in Reading, *Quarterly Journal of Experimental Psychology*, 33A, pp. 439–454, 1981.
6. F. Williams, *Language and Speech: Introductory Perspectives*, Prentice-Hall, Englewood Cliffs, New Jersey, 1972.
7. D. Bolinger, *Language, the Loaded Weapon*, Longman, New York, 1980.
8. S. Pinker, *The Language Instinct: How the Mind Creates Language*, William Morrow and Company, New York, 1994.
9. *Merriam-Webster's Collegiate Dictionary*, 10th ed., 1993.
10. W. Gabbert, Factors Influencing Readability, in *Proceedings of the 22nd International Technical Communication Conference*, Society for Technical Communication, Arlington, Virginia, pp. 333–336, 1975.