

Issues in Scientific Writing: Paraphrasing, Plagiarism, and Misrepresentation

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Integrity is essential for the credibility of scholarship, so much so that self-imposed ethical standards among scientists typically exceed those of criminal law, although various degrees of “infractions” still occur (Wadman, 2005). For example, simultaneously submitting a manuscript to more than one journal is legal but unethical in science, and the offending author might be prohibited from publishing in those journals in the future. Integrity in research also obliges a researcher to test hypotheses with appropriate methods and statistics, not those most likely to provide desired outcomes. Similarly, omitting contrary data obtained in research to strengthen a desired outcome is unethical. In addition to the integrity associated with the research itself, there are important ethical issues associated with writing about research for journal publications, dissertations, theses, reports, and similar formats.

Several recent references provide excellent information about how to write effectively (e.g., Day, 1995; Carraway, 2006; McMillan, 2006; Pechenik, 2006; Hacker, 2007) and how to prepare biological manuscripts (e.g., Day and Gastel, 2006; Carraway, 2007; Divan, 2009). One of the most challenging aspects of scientific writing results from the fact that scientific inquiry is an accumulative process, building on previous research and prior knowledge. In this regard, the challenge that confronts scientists while writing is how to use the published work of others to assess their own research, while appropriately presenting the concepts and written record of other authors without plagiarizing them. Black’s Law Dictionary (eighth edition, 2004:1187) defined plagiarism (from the Latin *plagiarius*: kidnapper) as “The deliberate and knowing presentation of another person’s original or creative expressions as one’s own.” Plagiarism is an egregious infraction that can result in possible legal charges of fraud or copyright infringement, possible prohibition from publishing again in a journal, or other penalties. This essay is a detailed summary of my concept of plagiarism and related issues in scientific writing.

Within the scientific community, the concept of plagiarism is more restrictive than the legal definition. For example, writing guides (e.g., McMillan, 2006; Pechenik, 2006; Hacker, 2007; Turabian, 2007; Divan, 2009; Greene, 2010; Hofmann, 2010) describe plagiarism as including minor changes of a few words in the original text while retaining the same structure of the sentence or paragraph, even if the original source is cited. This is sometimes referred to as unintentional or inadvertent plagiarism (McMillan, 2006; Pechenik, 2006; Turabian, 2007) because the author is using some terms of their own and

is not directly quoting the original source, which is properly cited. Part of the reason for this restrictive concept of plagiarism is that essentially retaining the original text when it is not necessary to do so can mask a lack of knowledge (for a recent example, see Brumfiel, 2007).

To illustrate this strict concept of plagiarism in scientific writing, consider the following passage from an article by Maricle and Lee (2002). Note that the use of indentations replaces quotation marks at the beginning and end of this block quote.

The strategy of aerenchyma development in response to flooding may involve a tradeoff between maintaining physiological function and the need to reduce tissue respiration. While aerenchyma systems can provide benefits to the plant in terms of facilitating oxygen transport and increasing metabolic efficiency, the formation of aerenchyma also presents certain costs. Eliminating cortex tissue can impede root functions such as water and mineral uptake and transport (Moog, 1998).

Compare that quote with the following passage from an article published two years later (Purnobasuki and Suzuki, 2004). Identical passages to the preceding quote are in italics; substitutions are in bold.

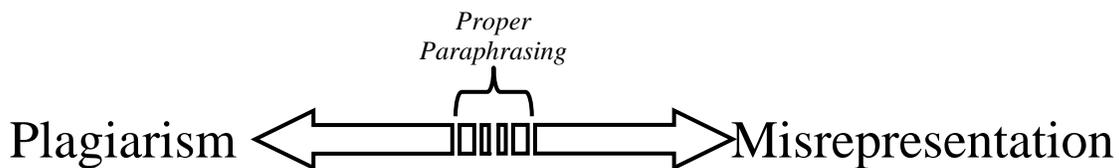
*The strategy of aerenchyma development in response to **anaerobic conditions** may involve a tradeoff between maintaining physiological function and **reducing** tissue respiration. While **the aerenchyma system[s]** can provide benefits to the plant in terms of facilitating oxygen transport and increasing metabolic efficiency, the formation of aerenchyma also presents certain costs. **Loss of** cortex tissue can impede **other** root functions such as water and mineral uptake and transport (Moog[,] 1998).*

The two passages are virtually identical, with only one substantive change, replacing the original term “flooding” with “anaerobic conditions.” The second quotation is clearly a case of plagiarism because the original source was not cited (although it was cited elsewhere in the article). In addition, McMillan (2006) emphasized, “*It is still plagiarism if you use an author’s key phrases or sentence structure in a way that implies they are your own, even if you cite the source*” [emphasis in the original]. Thus, even with a citation for Maricle and Lee (2002), the second quotation would still be considered plagiarism based on the concept described in writing manuals for biologists (McMillan, 2006; Pechenik, 2006; Hacker, 2007; Turabian, 2007; Divan, 2009). The key to avoiding plagiarism, then, involves appropriately altering both terms and sentence structure. The latter is important, especially in longer passages, because simply substituting a few synonyms can be a sign that these authors do not fully understand what they are writing. It also can result in introductions, and even portions of other sections of manuscripts, that are simply a collage of the writings of other authors.

Plagiarism is at one end of a continuum, with misrepresentation at the opposite end (Figure 1). Using the words of another person without attribution obviously is plagiarism. This is the type of plagiarism that teachers worry about receiving from students who copy

text from on-line or printed sources. In fact, the topics of proper referencing and plagiarism are the subject of an entire book written for students (Neville, 2007). Conversely, misrepresenting a concept presented by others through imprecise changes in words and phrases while trying to avoid plagiarism is equally inappropriate, although this typically receives less attention in writing manuals. However, within the center of this continuum between the obvious extremes, there is no clear consensus about what constitutes appropriate reference to other works without plagiarizing or misrepresenting them, and each question must be considered individually, which makes this such a challenging issue, even for experienced writers. For example, some scientists accept the use of an arbitrary number of consecutive words—four words, five words, six words—identical to those in the original text before quotation marks must be used to avoid plagiarism. However, no universal rule exists about the acceptable number of identical words, and the different opinions illustrate the difficulty of trying to define plagiarism precisely.

Figure 1—Paraphrase Continuum. The twin perils of paraphrasing. Plagiarism—implying or claiming that the work of others is your own—results either from insufficient paraphrasing of the original text or from lack of an appropriate citation. Misrepresentation—inaccurately altering or attributing the work of others—results either from paraphrasing that alters the meaning of the original text or from providing a misplaced citation within the text. Although consensus generally exists on what is inappropriate in scientific writing at the two extremes, scientists differ in their interpretations of what constitutes proper paraphrasing between these two extremes.



To avoid plagiarism and misrepresentation, writers must master two processes other than direct quotation (McMillan, 2006; Hacker, 2007; Neville, 2007; Turabian, 2007). I define these processes as follows:

Paraphrase: to express a concept of other authors or speakers with proper citation in approximately the same number of words, but using different words and sentence structure that do not misrepresent the concept in the original source, while retaining commonly used terms to provide precision of language.

Summarize: to express a concept of other authors or speakers with proper citation in substantially fewer words that do not misrepresent the concept presented in the original source.

I paraphrased and then expanded these two definitions from text in the scientific writing guide by McMillan (2006:30): “A paraphrase expresses certain facts or ideas in different

wording—your own—but in about the same number of words as the original. A summary expresses the important facts and ideas in fewer words than the original....”

An important consideration often overlooked by authors when paraphrasing or summarizing text is the level of certainty or uncertainty expressed in the original source. In most cases where a concept is not generally accepted as certain, a paraphrase or summary should retain terms of uncertainty—for example, hedge words such as “probably”—or otherwise convey the same level of uncertainty expressed in the original source. Horn (2001) provided a summary and analysis of the use of hedged statements in scientific writing and concluded that biologists publishing in English-language journals retained hedges expressed by the original authors 60-68% of the time.

In general, writing a summary is relatively easy for a careful writer because the goal is to substantially condense the text to pertinent facts or concepts; it is not the phrase-for-phrase type of match used in paraphrasing, although correctly paraphrased statements should be used within the summary rather than direct quotes from the original source. One unique type of summary is the abstract, which summarizes the important elements of the longer article in a journal. The abstract is a unique type of summary because the same author writes the abstract and the article and often includes identical phrases, perhaps even identical sentences, in both. This is not plagiarism because the same author wrote both sections within a single publication. However, if an author wants to include the information in a different manuscript, then the stricter conventions of plagiarism could apply.

The more difficult task for scientific writers, then, is to learn the art of effective paraphrasing and to avoid the twin perils of plagiarism and misrepresentation. However, the nature of scientific writing makes this difficult. Good writers in science are taught to convey information in a clear and concise style, striving for accuracy and precision with an economy of the most appropriate words and phrases. If someone else has already used the most appropriate terms in a concise style (although not all authors do this), the authors paraphrasing the original source must attempt to do the same with their own words and sentence structure.

This is a challenge for all writers who publish in English-language journals, but especially so for scientists for whom English is a second language. English is widely used in scientific journals, including some journals published in countries where it is not the primary language, and on-line access to scientific journals is eroding language barriers even further. English also is widely used for oral presentations at meetings attended by people from several countries, each with a different primary language. For example, at an international meeting of ichthyologists in The Netherlands in 1991, a member of the host committee announced that the official language to be used for all presentations would be “broken English.” In writing, however, more scrutiny is directed toward the quality of the language used, and this creates a substantial challenge for writers trying to paraphrase appropriately outside their native language. However, not all cultures view plagiarism as

strictly as outlined in this essay (Day and Gastel, 2006; Brumfiel, 2007; Neville, 2007). As a result, it is not uncommon for authors for whom English is a second language to copy the content of English text without quotation marks in an effort to avoid misrepresentation, perhaps acknowledging the original source with citations. However, this can lead to acrimonious debate about whether this is appropriate in an international community of scientists (see example in Brumfiel, 2007).

The main challenge for a scientific writer paraphrasing another work is to select appropriate synonyms or phrases to replace the original text that does not need to be retained for precision of language; inappropriate synonyms could misrepresent the original concept. The complexity of the English language that makes it difficult to master, even for those who speak it as their primary language, also provides English with the power to express important subtleties of meaning, based in part on what Bragg (2004:56-57) referred to as “almost synonyms” —words that have nearly the same meaning but are subtly different. Thus, the true power of a thesaurus is not to find different words to describe the same feature, but rather to find the best word (accuracy) and to use it consistently (precision) within a manuscript and among manuscripts.

Choosing an alternate word or phrase for use in a paraphrased statement requires careful consideration of the meaning of each synonym. Authors should use the synonym (thesaurus) feature of word processing software with caution and always have a good dictionary available for words they do not know well. For example, word processing software might offer as a synonym for “plagiarize” the verb “copy,” defined in Merriam-Webster’s Collegiate Dictionary (eleventh edition, 2003:276) as “to make a copy or duplicate of,” which “suggests duplicating an original as nearly as possible.” Although plagiarism can result from a word-for-word duplication of the original text, changes considered insufficient also constitute plagiarism, as described in this essay and other sources cited. Conversely, copying text exactly, enclosing it within quotation marks, and providing a citation is not plagiarism. Thus, there are important differences in the meanings of the two words that would make “copy” a generally unsuitable synonym for “plagiarize” when paraphrasing this essay.

There is a final consideration when paraphrasing, or when writing original sentences: avoid potentially confusing terms. Jargon often is included in manuscripts (and oral presentations), although writing guides (Day, 1995; Carraway, 2006; McMillan, 2006; Hacker, 2007) recommend that authors avoid or limit its use. Jargon consists of terms used exclusively, or nearly so, by a specific group of people—terms that are often unintelligible to people outside that group. This can impair clarity and give the writing an elitist tone. According to Merriam-Webster’s Collegiate Dictionary (eleventh edition, 2003:670), jargon can be “obscure and often pretentious language marked by circumlocutions and long words.” Thus, in the broad sense, jargon can include terms that seem intended more to impress (“pretentious language”) than to educate with clear, concise terms. For example, the phrase “an order of magnitude greater” would be more

concisely stated, and clearer to more people, as the phrase “10 times greater.” However, my focus here is on the “obscure” language of jargon, which I define generally as terms not likely to be included in a standard dictionary, such as Merriam-Webster’s Collegiate Dictionary in the USA. I will qualify this definition by acknowledging that some technical terms not included in a standard dictionary are necessary to describe specific concepts or recent developments in science accurately, and a goal of scientific writing is to educate people, including appropriate expansion of their vocabulary. For example, in the early 1900s, the word “gene” was first used and, therefore, was not a part of the standard vocabulary of most people as it is now. Thus, it would be prudent to define or otherwise clarify some essential technical terms on their first use in a manuscript, based on an assessment of the potential audience. When assessing the *potential* audience, realize that it could be more inclusive than the initial audience, such as a scientific manuscript written for professional peers in a government agency that might be used subsequently to support legislation. For example, the following quote is commentary by a newspaper reporter and commentator about a management plan released for public comment by a state agency. The management plan is for a hybrid fish known as the wiper (*Morone saxatilis* × *M. chrysops*) (Corn 2008).

I was following along on the part about length limits and mortality of fish caught during summer months.

What threw me, however, was the part about creel limits, now set at two wipers a day.

That can be increased to five, however, when:

“1. W_r ’s of the hybrid population are below 75.

“2. CPUE of stock fish consistently exceeds target level.”

Say what?

The terms W_r (usually as W_r ; relative weight index, not world record) and CPUE (catch per unit of effort) clearly should be defined in a document intended for public comment. Decisions about what terms to use and whether to define them are part of the art of scientific writing that each writer must develop with experience. The distinction between jargon and appropriate technical terms is not always clear, just as the distinction is not always clear between appropriate paraphrasing and plagiarism or misrepresentation, but being considerate of the potential audience is a good guide.

Similarly, idioms—terms with a nonliteral meaning—should be avoided, as in the sentence, “Current research has only begun to *scratch the surface*.” Documents now routinely cross international borders, and idioms can confuse and frustrate people who do not speak English as their first language, contributing to the temptation to plagiarize as mentioned previously in this essay. Even some nonidiomatic terms with multiple meanings can be confusing. For example, the phrase “...a fallen tree will *impact* forest vegetation...” could mean that the fallen tree will *strike vegetation with force* or it will *affect* some ecological attribute of the plant community (or both). Text filled with jargon,

idioms, and other confusing terms is among the easiest to paraphrase—and to improve—by substituting synonyms that are more appropriate.

In addition to avoiding jargon and other potentially confusing terms, I agree with Carraway (2006) that writers should avoid nonstandard abbreviations, even if defined on first use. For example, GPC refers to the greater prairie chicken in ornithology, but it refers to the global product classification code in business. Similarly, the abbreviation SNP could represent either Saguaro National Park or Shenandoah National Park. Such abbreviations are rarely warranted, except possibly in a space-limited figure or table (if defined in the legend), and they are rude to readers. When prudent, I recommend that at least the unique elements of an abbreviated phrase be used after first defined—for example, Saguaro NP, but not Greater PC. In general, nonstandard abbreviations are an avoidable aspect of scientific writing (and speaking) that I refer to as language laziness, and they are akin to jargon. See Table 3 for another example of language laziness and Table 4 for an example of the appropriate use of standard abbreviations in scientific writing.

To illustrate how to avoid plagiarism and misrepresentation as presented in this essay, Tables 1-4 include examples of appropriate and inappropriate paraphrasing in scientific writing. Each table includes an original sentence (or sentences) followed by three paraphrased versions: the first illustrates plagiarism, the second illustrates misrepresentation, and the third illustrates a correctly paraphrased statement. Analysis of each paraphrased sentence explains the pros and cons of each example. Plagiarized sentences in the examples retain the structure and phrases of the originals. This is not always inappropriate for phrases or other groups of terms commonly used in the discipline, as explained in Table 1. However, all “students” of scientific writing are encouraged to practice the art of restructuring sentences regularly when paraphrasing. If this is difficult at some point in your own writing, ensure that you fully understand what the original source describes. Developing your best writing skills requires a lifetime of practice.

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First, I thank A. Zavala, a former student, whose insightful questions helped me to see the need to write this essay and, thus, to clarify the concepts of plagiarism and misrepresentation in my own mind to help me better instruct students in scientific writing. It is a wonderful experience when insight flows from student to teacher. I also thank B. Maricle and R. Nicholson (Fort Hays State University, Kansas, USA) and K. Szigeti (University of Waterloo, Ontario, Canada) for input on drafts of this manuscript that led directly to what I hope were improvements in this essay, although these people do not necessarily agree with all of the views I have expressed. I also thank the numerous students and colleagues in the USA, Mexico, and other countries whose questions about scientific writing through the years contributed to my own education as a writer and editor and led me to this understanding of the sometimes contentious issues described in

this essay; this process is ongoing. Lastly, I acknowledge my ancestors, who lent their surnames to examples in the tables.

Literature Cited

- Bragg, M. 2004. *The adventure of English: the biography of a language*. Arcade Publishing, New York.
- Brumfiel, G. 2007. Turkish physicists face accusations of plagiarism. *Nature* 449:8.
- Carraway, L. N. 2006. Improve scientific writing and avoid perishing. *American Midland Naturalist* 155:383-394.
- Carraway, L. N. 2007. Content and organization of a scientific paper. *American Midland Naturalist* 157:412-422.
- Corn, M. 2008. Up for public review, wiper plan is interesting reading. *Hays Daily News*, Hays, Kansas, 12 September 2008, page A8.
- Davin, A. 2009. *Communication skills for the biosciences: a graduate guide*. Oxford University Press, New York.
- Dawson, T. E. 1998. Fog in the California redwood forest: ecosystem inputs and use by plants. *Oecologia* 117:476-485.
- Day, R. A. 1995. *Scientific English*, second edition. Oryx Press, Phoenix, Arizona.
- Day, R. A., and B. Gastel. 2006. *How to write and publish a scientific paper*, sixth edition. Greenwood Press, Westport, Connecticut.
- Franklin, J. F. 1988. Pacific Northwest forests. Pages 103-130 in: M. G. Barbour and W. D. Billings, editors. *North American terrestrial vegetation*. Cambridge University Press, Cambridge, United Kingdom.
- Greene, L. 2010. *Writing in the life sciences: a critical thinking approach*. Oxford University Press, New York.
- Hacker, D. 2007. *A writer's reference*, sixth edition. Bedford/St. Martin's, Boston, Massachusetts.
- Hofmann, A.H. 2010. *Scientific writing and communication: papers, proposals, and presentations*. Oxford University Press, New York.
- Horn, K. 2001. The consequences of citing hedged statements in scientific research articles. *BioScience* 51:1086-1093.
- Maricle, B. R., and R. W. Lee. 2002. Aerenchyma development and oxygen transport in the estuarine cordgrasses *Spartina alterniflora* and *S. anglica*. *Aquatic Botany* 74:109-120.
- McMillan, V. E. 2006. *Writing papers in the biological sciences*, fourth edition. Bedford/St. Martin's, Boston, Massachusetts.
- Neville, C. 2007. *The complete guide to referencing and avoiding plagiarism*. Open University Press/McGraw-Hill Education, Maidenhead, England.
- Pechenik, J. A. 2006. *A short guide to writing about biology*, sixth edition. HarperCollins College Publishers, New York.
- Purnobasuki, H., and M. Suzuki. 2004. Aerenchyma formation and porosity in root of a mangrove plant, *Sonneratia alba* (Lythraceae). *Journal of Plant Research* 117:465-472.
- Turabian, K. L. 2007. *A manual for writers of research papers, theses, and dissertations*, seventh edition. Revised by W. C. Booth, G.G. Colomb, J. M. Williams, and the University of Chicago Press editorial staff. University of Chicago Press, Chicago, Illinois.

Wadman, M. 2005. One in three scientists confesses to having sinned. *Nature* 435:718-719.

Table 1—Examples and analysis of sentences representative of plagiarism, misrepresentation, and correct paraphrasing: *general principles and appropriate placement of citations.* All of the sentences were created for this example.

Original sentence(s)	Paraphrased sentences		
	Plagiarism	Misrepresentation	Correct paraphrase
<p>Smith and Jones (2002): We measured nitrate, total phosphorus, dissolved oxygen, and turbidity at each spring pool inhabited by Arkansas darters in the Nescatunga Creek basin.</p> <p>Johnson (2003): I measured chloride and carbonate at each spring pool inhabited by Arkansas darters in the Nescatunga Creek basin.</p> <p>Taylor (2003): I determined substrate composition at each spring pool inhabited by Arkansas darters in the Nescatunga Creek basin.</p>	<p>Smith and Jones (2002) studied dissolved oxygen, nitrate, total phosphorus, and turbidity; Johnson (2003) studied carbonate and chloride; and Taylor (2003) studied substrate composition in spring pools inhabited by the Arkansas darter in the Nescatunga Creek basin.</p>	<p>Environmental features of Arkansas darter habitat studied in the Nescatunga Creek basin include water chemistry and substrate materials (Smith and Jones, 2002; Johnson, 2003; Taylor, 2003).</p> <hr/> <p>Environmental features of Arkansas darter habitat studied in the Nescatunga Creek basin include nitrate, total phosphorus, dissolved oxygen, turbidity, chloride, carbonate, and substrate composition (Smith and Jones, 2002; Johnson, 2003; Taylor, 2003).</p>	<p>Environmental features of Arkansas darter habitat studied in the Nescatunga Creek basin include nitrate, total phosphorus, dissolved oxygen, turbidity (Smith and Jones, 2002), chloride, carbonate (Johnson, 2003), and substrate composition (Taylor, 2003).</p>
Analysis	<p>The plagiarized sentence retains the sentence structure of the three original sentences. The only differences are combining the three sentences, replacing the pronouns (we and I), alphabetizing the sequence of measured variables, and minor word substitutions. However, the citations are appropriately placed within the sentence.</p> <p>Sentence structure in both misrepresented sentences has been altered from the original sentences; however, both sentences use inappropriate citations at the end of the sentence, implying that all three studies measured all of the variables listed. The first misrepresented sentence also replaces the specific habitat variables with vague, uninformative terms, further misrepresenting the original source.</p> <p>The correctly paraphrased sentence has some phrases or lists in common with the original sentences, but other aspects of the sentence structure are substantially altered from the original sentences. The lists of environmental variables are retained to provide the most accurate information and permit proper citation. The sequence of chemical terms in the two sub-lists could be altered (e.g., alphabetized), but this is unnecessary. The chemicals are routinely measured in aquatic studies, so the terms and their sequences should not be perceived as unique to the original authors—in other words, the use of commonly used sequences of words is not plagiarism. Thus, the different circumstances regarding which terms and sentence structure should be altered to avoid plagiarism make it impossible to provide absolute guidelines.</p>		

Table 2—Examples and analysis of sentences representative of plagiarism, misrepresentation, and correct paraphrasing: common and “uncommon” knowledge. Sources for the original sentences are included in the Literature Cited. The paraphrased sentences were created for this example.

Original sentence(s)	Paraphrased sentences		
	Plagiarism	Misrepresentation	Correct paraphrase
<p>Franklin (1988): The coastal forests of northern California and southern Oregon are distinguished by the presence of <i>Sequoia sempervirens</i> [coast redwood].</p> <p>Dawson (1998): In summer, when fog was most frequent [in northern California], ~19% of the water within <i>S. sempervirens</i>, and ~66% of the water within the understory plants came from fog after it had dripped from tree foliage into the soil....</p>	<p>Coastal forests of northern California and southern Oregon are characterized by the presence of coast redwoods (Franklin, 1988). Dawson (1998) reported that, in summer, when most fog occurred, about 19% of the water in redwoods and about 66% of the water in understory plants came from fog dripping from the trees to the soil.</p>	<p>Coast redwood (<i>Sequoia sempervirens</i>) forests occur in northern California, where summer fog provides the redwoods and understory plants with about 19-66% of their water (Dawson, 1998).</p>	<p>Coast redwood (<i>Sequoia sempervirens</i>) forests occur in northern California, where fog occurs principally during the summer. This fog provides the redwoods with about 19% of their water, and water falling from the tree leaves provides understory plants with about 66% of their water (Dawson, 1998).</p>
Analysis	<p>Both plagiarized sentences retain the structures of the originals, with only minor changes in terms. Although the presence of redwood forests along the coast of northern California could be considered common knowledge and, therefore, would not require the citation, the similarity with the original source is inappropriate even with the citation.</p> <p>The misrepresented sentence has appropriately altered sentence structure and a citation for the original information from the article by Dawson (1998). However, it inappropriately summarizes the values for water in the two categories of plants mentioned in the original sentence.</p> <p>The correctly paraphrased sentences have appropriately altered sentence structure. The presence of redwood forests along the coast of northern California is common knowledge; thus, the citation for Franklin (1988) is not necessary with the distinctive sentence structure here. The second sentence in the original source contains specific information about redwood forest ecology that is not common knowledge; therefore, a citation is necessary, even with the altered sentence structure.</p>		

Table 3—Examples and analysis of sentences representative of plagiarism, misrepresentation, and correct paraphrasing: retaining uncertainty (*hedge words*). All of the sentences were created for this example.

Original sentence(s)	Paraphrased sentences		
	Plagiarism	Misrepresentation	Correct paraphrase
<p>Finnegan and Arrow (1999): Introduction of nonnative predators (largemouth bass) probably led to the extirpation of the Topeka shiner from Willow Creek.</p> <p>Hill (2006): Largemouth bass were introduced into the impoundment constructed on Mill Creek in 1999, and the native Topeka shiner was extirpated from the creek upstream from the dam by 2002.</p>	<p>Stocking of nonnative largemouth bass probably extirpated the Topeka shiner from Willow Creek (Finnegan and Arrow, 1999). Largemouth bass were stocked into a pond constructed on Mill Creek in 1999, and the Topeka shiner was extirpated from the stream above the dam three years later (Hill, 2006).</p>	<p>Finnegan and Arrow (1999) found that the Topeka shiner was extirpated from Willow Creek following introduction of nonnative largemouth bass, and Hill (2006) reported similar findings in Mill Creek.</p>	<p>Finnegan and Arrow (1999) suggested that the Topeka shiner was extirpated from Willow Creek following introduction of nonnative largemouth bass. Hill (2006) reported a similar conclusion after studying Topeka shiners in Mill Creek prior to and following introduction of nonnative largemouth bass upstream from an impoundment.</p>
Analysis	<p>The first plagiarized sentence retains the uncertainty expressed in the original (“...probably...”), but both plagiarized sentences retain the structures of the originals, with only minor changes in terms.</p> <p>The misrepresented sentence has appropriately altered sentence structure, but it omits the uncertainty (“...<i>probably</i> led to the extirpation...”) expressed in the first original sentence and equates the degree of certainty with that in the second original sentence, thus misrepresenting the conclusions of Finnegan and Arrow (1999). Also, unless referring to the recovery of lost items, avoid using the verb “found” (“Finnegan and Arrow...<i>found</i> that the Topeka shiner was extirpated...”). There is always a more accurate synonym, and overuse of the verb “found” in scientific writing is an example of language laziness.</p> <p>The correctly paraphrased sentence has an appropriately altered sentence structure and retains the uncertainty (“Finnegan and Arrow...<i>suggested</i>...”) expressed in the first original sentence, while supporting the hypothesis with the second original sentence.</p>		

Table 4—Examples and analysis of sentences representative of plagiarism, misrepresentation, and correct paraphrasing: *conversion of units of measure*. All of the sentences were created for this example.

Original sentence(s)	Paraphrased sentences		
	Plagiarism	Misrepresentation	Correct paraphrase
LaFond (1929): The total length of the [type] specimen was 2 inches.	Total length of the type specimen was 5.08 cm (LaFond, 1929).	LaFond (1929) reported that the type specimen had a total length of 51 mm.	LaFond (1929) reported that the type specimen had a total length of 2 inches (~51 mm).
Analysis	<p>The plagiarized sentence retains essentially the same sentence structure as the original, with the inclusion of an inappropriate conversion from an English unit to a metric unit.</p> <p>The misrepresented sentence has an appropriately altered sentence structure. However, this sentence also has an inappropriate conversion from an English unit to a metric unit similar to the one used in the plagiarized sentence.</p> <p>The correctly paraphrased sentence has an appropriately altered sentence structure and retains the original English measurement unit, with a parenthetical equivalent value in a metric unit. Using only the metric equivalent, as done in the plagiarized and misrepresented sentences, implies a greater precision of measure than the original value, and this constitutes a misrepresentation of information in the original source. Note that the word “inches” is spelled out, but millimeters is abbreviated, as is centimeters in the plagiarized sentence. Metric units associated with numbers are among the standard abbreviations that do not need to be defined on first use in most English-language journals.</p>		