

OPINION

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Confused and misused: English under attack in scientific literaturePublished online: 24 June 2003
© Springer-Verlag and SEM 2003**Introduction**

Why another discussion of the need for quality English in learned-science writing? There are numerous handbooks, manuals and style guides covering every aspect of English usage for scientific purposes. The leading texts are reissued regularly, and new guides are brought out nearly every year. There is no shortage of dictionaries, some of which have become classic reference works of our time. Is it justified to tackle the subject again, in a journal article?

The answer is a definite yes. Journals remain the primary source of information for scientists, who are chronically pressed for time and seldom read books published in fields outside their own. In addition, careless writing is not a dead issue [4, 5]. The “publish or perish” principle forces scientists to produce more and more papers with scant regard to the cosmetics of presentation. Indeed, many scientists are reluctant to develop even their mother-tongue writing skills. “The better is the enemy of the well,” they often quote from Voltaire, to mean that “slight deficiencies” in form should be no bar to readers’ appreciation of science content. Ultimately, the question remains: will a text containing language flaws be appreciated? As Lutikhuzen [12] remarks, “By underestimating the time and effort you put into your writing, you are in a sense underestimating your research.” This article, organized as a “quick guide” to idiomatic English writing, is fo-

cused on the use and misuse of English in the major scientific literature.

Corpus

Examples were culled from 155 journals and proceedings articles published between 1984 and 2001, and from a monograph, by American authors, published in 1986 (Table 1). Of the 155 articles analysed, 34 were written by people whose first language is English (American, Australian, British and Canadian), 101 were written by second-language speakers from Eastern and Western Europe, 14 were written jointly by first- and second-language speakers, and six were written by second-language speakers from Brazil, China, Russia and Thailand. The articles were chosen from several disciplines: microbiology, biochemistry, ecology and the environment, and plant and soil sciences.

With the exception of “methodological”, all the words we consider belong to the general-purpose vocabulary. Most of the definitions are based on those provided by the Revised Edition of *Webster’s II New Riverside Dictionary*, 1996 [11], a widely available, everyday dictionary of current usage. A few examples were edited for length, but none were corrected to improve grammar or clarity.

Words confused and misused

Because “certain words and phrases are constantly misused even in reputable international journals” [13], it is inevitable that the same errors are pointed out by different experts on scientific writing. The most commonly confused and misused words are “affect” and “effect”, “alternate” and “alternative”, “regime” and “regimen”, “that” and “which”, “use” and “employ”, “use” and “utilize”, and “while” and “whereas” [e.g. 2, 8, 13]. Besides these, we have found several others. In choosing words for discussion, we sought to minimize

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Table 1 Books and journals used in this study**Books**

- Curl EA, Truelove B (1986) *The rhizosphere*. Springer-Verlag, Berlin
- Thomas Telford (2000) Proceedings of the Seventh International FZK/TNO Conference on Contaminated Soil, 18–22 September 2000, Leipzig, Germany, vol 1. Thomas Telford, London

Journals (publication years are given in parentheses)

- Ecosystems* (1998)
- Environmental Science and Technology* (2001)
- European Journal of Biochemistry* (1984)
- Journal of Bacteriology* (1996)
- Plant and Soil* (1991)
- Plant Physiology* (1988)
- Proceedings of the National Academy of Sciences of the United States of America* (1991)

overlap with the established literature; where it does occur, the reference is cited. For simplicity sake and for easy reference, entries appear in alphabetical order.

Affect vs. effect

The difference between “affect” and “effect” is a hobby horse of style manuals, yet many people find it hard to remember. Part of the confusion probably arises because both words can be used as a verb and as a noun. In the *ASA–CSSA–SSSA Publications Handbook and Style Manual*, the distinction between the verbs is described thus: “‘To affect’ means to act upon something that already exists; ‘to effect’ means to bring some thing or condition into existence,” and that between the nouns, thus: “‘An ‘effect’ is a result or outcome; an ‘affect’ is an emotion ...” [2]. The misuse of “affect” (a verb) in place of “effect” (a noun) is so widespread that even high-standard and otherwise well-edited journals and books are not immune to it. Take the following examples (italics added): “The presence of plasmid pEND4K had no *affect* on tumor induction.” “Any process affecting plant growth or physiology could have an *affect* on the quality and quantity of materials exuded by the roots.” “Effluent pH values near 7.7 were due to liming amendments as opposed to *affects* of the unbuffered influent solution [...] We are interested in the *affect* of P:As ratio on the reduction kinetics of As(V)” [twice in one article!]. Obviously, the intended meaning was that the presence of the plasmid had no *effect* on tumor induction or that plant-growth-affecting processes had an *effect* on the exuded materials. But how many neophyte writers and translators will eventually be led to believe that the expression “to have an affect” refers to a result or an outcome, and how long will it take the error to secure a place in dictionaries as an acceptable usage on account of its frequency?

There are two effective ways to ensure that the correct word is used in any given instance: (1) Consult an explanatory dictionary. (2) Give up “affect” as well as “effect” for the sake of precision (e.g. “amino acids were

stimulatory to ethylene biosynthesis” rather than “...had a stimulatory effect on...”).

Appropriated vs. appropriate

The confusion of “appropriate” with “appropriated” may tarnish the hapless author’s reputation not only as a writer, but also as a professional. Examples: “By selecting appropriated techniques, very little soil replacement is necessary.” “This method is appropriated within the framework of early preliminary investigations on contaminated sites.” Techniques that are appropriate are suitable for a particular occasion. Techniques that are “appropriated” (the past participle of the verb “to appropriate”) are as good as stolen. Scientific misconduct is just a letter away! This confusion is not ubiquitous (we noticed it only in two articles), but it deserves mention in order that readers be alert to those one-letter (e.g. “affect”/“effect”) and one-character (e.g. “it’s”/“its”) pitfalls that are a global occurrence.

Base vs. basis

“Base” and “basis” have very similar meanings, but “base” is normally reserved for the literal (“lowest part”) and “basis” for the metaphoric (“principle”) sense. Just as no one in the world has ever heard of a “‘first come, first served’ base”, there are no such things as “the base of the soil protection” or “the molecular base of plant–bacteria interactions”.

Experienced vs. established

A human being can be experienced; an investigative technique, as in “evaluation of the available *experienced* [italics added] techniques”, cannot. In this example, “established” would be the more suitable term.

It’s vs. its

“It’s”, a contraction of “it is” or “it has”, and “its”, a possessive adjective, are “the champs, surely the most often confused words in English” [7]. A related and even more common practice is to insert “an illiterate apostrophe” [3] in anything that ends in “s” (“quoting one of the examiner’s”, “polychlorinated biphenyl’s”, or even “for always and ever”). Our research suggests that errors of this type are mainly the native-English speaker’s problem: “...land which is presenting an unacceptable risk in it’s current form.” “A motion is proposed by the House, and this motion is vigorously supported by it’s Proposer in an initial presentation.” Occasionally, they creep into non-native-English authors’ writing: “The flotation technique has proven it’s value for around 100 years.”

The last three examples are all taken from proceedings articles. We thought journal pages were free from the “false possessive/plural” affliction until we stumbled on an advertisement placed for the “Reviews of Environmental Contamination and Toxicology” book series. The advertisement ran: “Now in it’s 150th volume!”

Methodical vs. methodological

The misuse of “methodical” instead of “methodological” is typical of non-native speakers, apparently because they are confused by the similarly sounding words in their first languages (*metodicheski* in Russian, *méthodique* in French, *methodisch* in German, etc.). Another reason for the misuse might be that “methodological” is sadly omitted from certain dictionaries. A word of guidance on this point, therefore, seems in place. If the meaning is “carried out with order or method”, “methodical” is the right adjective, as in “methodical investigations”. If one is trying to get across the idea “of or related to methodology”, the use of “methodological” is appropriate.

Part vs. some

A report in a European journal suggests that “a part of” the gangliosides examined by the authors “may be of foreign origin”. Scientifically that suggestion may be true, but linguistically it is wrong for two reasons. First, “it is unusual to use ‘a’ before ‘part of’ unless ‘part of’ is modified by an adjective” [10]. (Thanks to slack editors, the indefinite article preceding an unmodified “part of” is now fairly common.) Second, “part of” must come before either an uncountable noun or a countable noun in the singular [10]. In other words, “part of the ganglioside” (singular) is acceptable; “part of the gangliosides” (plural) is substandard English for “some of the gangliosides”. “Some” works also for the less-common variation “parts of”, as in “parts of the results can be transferred to other contaminant scenarios”.

These vs. those

These pronouns are sometimes misused in textual references. “These authors” is quite correct (though slightly verbose) for the writers of a paper, but it is unsuitable when one is referring to the work of others. A typical example: “Additional evidence for our results is provided by the work of Chapot et al. These authors found that...” In careful English, “these authors” always means “we, the authors”. The writers spoken of are “those authors”, or “the authors”, or, best of all, “they”. In short, “these” means “here” and “those” means “there”.

Utilize vs. use

“Utilize” has come in for a great deal of criticism over its excessive use in newspaper and business English [9]. It is also a favourite with authors of scientific papers. To an extent, this preference is excusable: “to utilize” something is “to make good use” of it. The problem is that the distinction between use and good use is largely subjective, making “utilize” justifiable in every piece of work claiming to have achieved its object. As a result, few papers do not have it used at least once.

A better definition of “utilize” is “to find some unexpected use for an object or procedure” [2]. It is unambiguous and is helpful when there is difficulty of interpretation. Following is one tricky passage: “RSF1010 is a nonconjugal plasmid in that it does not carry all the genetic information to promote its own transfer into other bacteria. However, RSF1010 can utilize a transfer machinery encoded by another conjugative plasmid present in the same host for its transfer into other bacteria.” On the one hand, RSF1010 makes good, practical use of the transfer machinery. On the other hand, a transfer machinery does serve the purpose of transfer, and RSF1010 cannot “utilize” it, even if the machinery is encoded by another plasmid. Rather, RSF1010 *uses* the transfer machinery, in exactly the same way as job seekers use (not utilize!) other people’s names as references.

Conclusions

So who can remedy the “quality erosion” of scientific English-language writing?

Authors: No scientist is expected to have a trained linguist-like command of English, but a lack of care to rectify glaring errors before publication is hard to forgive. This lack of care presumably stems from a general lack of interest in and respect for scientific genre.

(Copy-)Editors: Whereas “editorial rewriting” is justly viewed as unethical [6], loose usages given editorial blessings acquire legitimacy and with time may turn into persistent “language germs”. This is especially true of symposia volumes prepared in camera-ready format.

Native speakers: Many scientists are on the faculty at academic institutions. Hence, there is an educational aspect to this endeavour: non-native-English students learn to write by modelling on what has been produced by their native senior colleagues and teachers; and, in so doing, they “tend to record indiscriminately all the words and word-combinations they find as proper, correct, even admirable ways of saying it in English” [1].

Publishers: The “consult a native speaker” type of advice, used by many journals, may not be the best course of action: native speakers are not equally competent to help with the peculiarities of grammar and style. Editorial guidelines—whether they are for the submission of a journal article or book chapter—should

be supplemented by a professionally compiled “Hints on Language Use” section identifying common pitfalls of English usage and ways to avoid them. Such a section would occupy a minimum of printed pages and would be read with profit by non-native speakers of English, especially by those who are not taught courses on scientific English writing in their home countries. Let us respect our readers and our editors. Let us be our own editors.

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