

# Perceptions of Accuracy in Science Writing

**Abstract**—*Technical experts and writers often disagree about what constitutes accuracy in popular writings about science and technology, such as news media reports. In previous attempts to quantify accuracy in science news reporting, many of the sources' comments pointed to objective errors, but a sizable number dealt with lack of completeness or stylistic issues. There has been no consensus among communication researchers on the kind of scheme that should be used to code such information. We suggest a scheme for categorizing empirical information about the different kinds of perceived "errors" that technical sources identify in articles about their work by journalists and other writers. This study may lead to strategies for enhancing the accuracy of popular writings about science and technology.*

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**Index Terms**—*Accuracy in science writing, error perception, science writing.*

Manuscript received April 9, 2002;  
revised May 1, 2002.

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IEEE PII 10.1109/TPC.2002.801632.

**M**uch research on accuracy in science news writing investigates the complex relationship between scientists and the writers who report on their work. The different goals and cultures of each profession often create conflict in deciding what constitutes accuracy of media reports and articles for general audiences.

Many studies have shown that scientists question the accuracy of mass media accounts of scientific work [1]–[6]. Because the discourse communities of the two professions are very different, this perception of inaccuracy is not surprising. Scientists place a high value on objectivity, detail, and unemotional, impersonal form and style [7], while journalists and editors emphasize brevity, imagery, anecdote, metaphor, and other devices that will entertain and inform readers [8], [9].

While comments made by technical sources in previous studies have addressed many aspects of journalistic writing, a

prominent concern has been that journalistic accounts tend to be incomplete. Because journalists are part of a culture that values brevity, often constraining writing closely by word count, it is not surprising that conflicts arise over completeness. Journalists must prioritize information about a new discovery. Only the most salient and crucial points of the research can be included, so many details necessarily are omitted.

The translation process itself can also lead to omissions. As Dunwoody [10] observed, the translation from jargon-heavy research reports to public-friendly articles in the press results in some information loss because there is often no "plain language" terminology to describe technical subjects. Do these changes constitute inaccuracies in reporting or merely a different use of language?

## THE NATURE OF ACCURACY

In a study by Tankard and Ryan [2], scientists said that

journalistic accounts of scientific research lacked relevant and important information, including contextual and methodological detail. Contextual detail included continuity with earlier research reported, and methodological detail included descriptions of sample size or study population. Moore and Singletary [4] found that sources identified three top errors:

1. inadequate air time (38.4%),
2. essential detail omitted (35.4%), and
3. treatment of story too sensational (29.3%).

Borman [3] found that omission of information was ranked as the most serious flaw, including failure to mention research methods, incomplete information about important research results, and lack of qualifying statements important for an accurate impression. In a study by Tichenor et al. [1], sources rated "overemphasis on the unique" as the most serious problem, followed closely by "omission of relevant information" and "misleading headlines."

These critiques have called into question the very meaning of accuracy in the literature on science writing. In particular, Dunwoody [10] theorizes that scientists and engineers have not closely examined what they mean by accuracy, and she suggests that many, although not all, errors identified by this group are "perceived errors" rather than actual errors. Dunwoody categorizes the "errors" identified by scientists as either objective or subjective. Objective errors are those of fact, often a number, a date, or a misspelling that both parties can agree is erroneous. Subjective errors are harder to quantify. They are differences in interpretation that reputable scientists may well disagree about. These are changes in language that cause a shift in scientific

meaning, such as errors in context and emphasis, among others.

Tankard and Ryan [2] went further than this, identifying 42 error types, many of which fall into Dunwoody's "subjective" category. In a follow-up study, Pulford [11] found that the sheer number of categories available in the study may have caused an overestimation of the frequency of errors in mass media accounts of science news. By condensing the categories from 42 to 11, Pulford saw a drop in reported error rate from 6.2 errors per story to 2.16 per story. This finding alone suggests that perceptions of accuracy have not been concrete or consistent. Furthermore, the error categories identified in both the original and condensed version are questionable. Is "science reported in a humorous vein" or "nonscientific aspects of study overemphasized" actually an error? Often, disagreements about style or usage have been classified as errors.

### PROPOSED CODIFICATION SCHEME

We have derived a codification scheme for categorizing such feedback from technical sources based on our work at the University of Washington in publishing a regional science news magazine *Northwest Science & Technology*. The authors developed the scheme based on feedback from sources gathered during the course of prepublication review of articles slated for publication in upcoming issues of the magazine—a practice routinely conducted at the magazine as an accuracy check.

Admittedly, prepublication review is a highly controversial practice among journalists. Some feel that allowing a source any access to a story before publication compromises the role of the journalist, including the objectivity of the piece and the independence of the journalist [12], [13]. Other journalists disagree, claiming

that the practice does not have to compromise journalistic autonomy or objectivity if the writer manages the process effectively [13]. In addition, this type of review frequently catches errors made by the writer [14], and it is routinely used by Public Information Officers and other in-house writers within technical organizations. Research has shown that science stories are more prone to error [11]; thus, prepublication review may be helpful in correcting errors before dissemination to the general public.

Prepublication review may take many forms at *Northwest Science & Technology* and at other magazines around the country, but one constant is that sources typically are asked to comment on "accuracy only." Nonetheless, responses from technical sources usually range from factual errors to suggestions regarding style and comments about lack of completeness. In our experience, sources often suggest stylistic changes even when explicitly asked to comment on technical accuracy only.

The number of sources consulted for review for feature length stories typically varies from one to many. The style of prepublication review may involve email, fax, or phone, depending on the particular circumstances (length of story, nature of material, nature of source). In some cases, an email that solicits feedback by a particular deadline is sent to the source, with the prepublished story included as an attachment. In the cases where fax and phone are used, the story or a portion thereof is faxed to the source, and feedback is obtained in writing via return fax or phone and then transcribed. Typically, feedback consists of suggested changes in wording, ranging from individual words to entire sentences or paragraphs.

The proposed codification scheme outlined below contains the categories that are necessary

and sufficient to encompass the vast majority of source comments obtained during prepublication review relating to errors or perceived inaccuracies:

1. **Minor corrections**, such as pluralization, spelling, or other changes to a single word, that do not alter meaning significantly. The corrections do not change the scientific meaning of the article. Example: misspelling of a nonscientific word.
2. **Objective technical errors**, such as errors in numbers/statistics, or other incorrect facts that affect the scientific/technical meaning of the writing. Example: stating a percentage as 15% when the correct value is 25%.
3. **Subjective errors**, or changes in language that result in changes in scientific meaning, interpretation, or emphasis, about which different reputable experts may disagree. Overstating the certainty of the science is one type. Example: writing that "x sometimes causes y," when the source believes it should read "x rarely causes y."
4. **Lack of completeness**, including omissions in naming collaborators, giving full titles instead of partial titles, and words/phrases that would help give a fuller account of the science, but not including any omissions that change the scientific meaning in a significant way. Example: "a University of Washington professor" would be more complete if it were changed to "a professor of physical chemistry at the University

of Washington," but the first version is not erroneous.

5. **Style and usage**, or changes that do not affect the technical information content or scientific meaning of the passage. Example: "adjacent" and "located next to" both essentially convey the same meaning, but are stylistically different word choices.

The five-category scheme distinguishes between those changes that affect the scientific/technical meaning versus those that do not. Furthermore, the scheme distinguishes between objective errors, those scientists working in the field are not likely to disagree about, from subjective matters, such as issues of scientific interpretation.

During one period in which feedback was tracked at *Northwest Science & Technology*, we found that minor (15%) and objective (20%–25%) corrections together accounted for roughly 35%–40% of sources' comments; lack of completeness accounted for approximately 20%–25% of comments; style and usage, about 20%–25% of comments; and subjective errors about 10% of comments.

Several factors are considered in deciding whether or not to implement changes suggested by sources. First, is the suggested change a clear error? In the case of minor corrections and objective technical errors, there is usually no question about implementing the change.

For comments falling into category 4, lack of completeness, there is usually a tradeoff

associated with implementing the comment: preserving brevity versus providing a more complete account.

In the case of style or usage comments, the decision-making process often is more complex. Typically, these changes are not implemented in cases where such a change would lead to a compromise in journalistic style.

In all cases, the goal of communicating scientific ideas to the public in an engaging, informative, and accurate manner is the driving force behind implementation decisions.

In science writing, the tension between keeping a reader engaged and providing accurate scientific detail is always a struggle. We have found that a large number of comments made by scientists point to actual errors (minor corrections, objective, or subjective), and it is advantageous to have the opportunity through a well-managed prepublication review to correct these problems.

Many comments made by scientists point to neither true errors nor a lack of completeness, but rather differences in opinion between the writer and the source about style and/or usage. The differences in the cultures and norms of the two professions are likely responsible for these different views of accuracy, yet there is room for the two communities to meet in the middle. Increased communication and open dialogue between technical sources and writers should continue in order to raise awareness, potentially to resolve differences, with the ultimate goal of enhancing the value of science writing for readers.

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