Writing and Editing for the Internet

A word from the CBE InterViews editor—The Internet is changing scientific communication and perhaps the way we write and edit. I discussed some of the possible changes with Paul Stapleton, head of the Publications Unit of the International Plant Genetics Resources Institute in Rome, because he had predicted a move toward the results-oriented writing away from the IMRAD format and, with 3 other writers, has recently published Scientific Writing for Agricultural Research Scientists: A Training Reference Manual. (West Africa Rice Development Association/Technical Centre for Agricultural and Rural Cooperation, The Netherlands). In the following interview he reviews his own stance on results-oriented writing for electronic publications, which does not necessarily reflect the views of his Institute. The other participants, Brian Mayall, professor of Laboratory Medicine and editor-in-chief of Gyomery at the University of California-San Francisco, and Todd McGee, postdoctoral fellow at the Department of Biological Sciences, Stanford University, discuss some changes brought about by electronic publications that were brought up at the 1996 CBE Airlie House Retreat. McGee said that he has gained insight into the field of electronic publishing through a partnership with HighWire Press, a group within Stanford University libraries that helps publish the Journal of Biological Chemistry, Journal of Neuroscience, and other biomedical publications on the World Wide Web.

Q: What changes do you see in scientific writing with the advent of the electronic age?

Stapleton: Ten years ago, before giving a talk at the CBE meeting at Ottawa, I became convinced that several elements of the classipaper were disposable. Do we need to slavishly reproduce every last experimental detail, right down to the model number of the spectrophotometer or give the full name of every enzyme used? Why are we spelling out our abbreviations when everyone knows what they mean? And what about those interminable lists of references, each of which must be checked and edited? Do we really need long paragraphs of background and introduction? When the “we” are scientists functioning in the same area of expertise, then the answer is a resounding NO! and many people at Ottawa agreed with me. In these days of increasing costs and dwindling budgets, a 1-page paper seemed the obvious answer, with a title, an abstract, an outline of the results, and, most important, some learned discussion and interpretation. A 64-page journal could publish 64 papers. Just think what that would mean.

Now we have the Internet, the Web page, and, more importantly, hyperlinks; we have reached nirvana. Now we can realize the potential of scientific communication and have our IMRAD cake and eat it in real time. We will have to learn new techniques in writing and be able to write in lovely page-sized chunks, with the most important sections up front, secure in the knowledge that the Web crawlers will be busily indexing the rest.

This leaves us staring at screens of super-concentrated information. Browsing will take on another meaning, as will writing. We will have to learn how to 1) concentrate on the most significant part of the paper and 2) compete against, not only other papers, but the Internet-induced short attention span. If you cannot get it all on the 1 page, then your reader is almost certainly going to click elsewhere. We will see a focusing of the mind and a much heavier emphasis on scholarly analysis. Simultaneously, papers will be written in sections, with links reaching out everywhere to supplementary sources of data. Journal editors will become expert Internet operatives and information scientists.

Mayall: Electronic communication and publishing offer the opportunity for true hierarchical writing, in which a series of different levels is associated with the publication of a given study. This is already happening. The highest level is the title and authors, which is very widely publicized not only in the published article, but also in Current Contents, MEDLINE, and such. The next level is the abstract (including key terms), which nowadays is almost as widely available. The 3rd level is the article itself, as published in the paper journal.

The electronic age offers the option of additional levels. For years, there has been a movement to establish access to the raw data associated with a study, but this never occurred out of respect for our forests and a recognition of complete impracticality of doing it with the printed medium. This constraint no longer exists.

Also, the materials and methods section of a typical article could be greatly shortened, if all the technical details required to replicate the results were relegated to a linked electronic appendix and only enough information for the reader to follow the experimental principles were included in this section.

As we move to paperless publication, authors will 1) realize its potential, such as in the examples I have suggested, and 2) discover its limitations. Writing effectively for the Web demands a lean, focused, more journalistic style, simple sentences and short paragraphs.

McGee: We must first answer the question, Are journal editors willing to be flexible enough to permit authors to experiment with new styles that suit electronic publication? I agree that the seemingly limitless space afforded by electronic publication, coupled with the need to present articles in screen-sized “chunks”, presents interesting opportunities and challenges. The adoption of a cleaner, more direct, journalistic style is an exciting possibility, but these and other attempts will be stillborn if the editorial staff is not willing to permit authors to experiment with new styles and approaches in the presentation of scientific information.

Rigid enforcement of the archaic and
cumbersome style, which predominates in today’s literature, discourages experimentation with new styles. With many journals rejecting more than 50% of submitted papers, what authors will take a chance using a new style they believe could lead to rejection out of hand? Before asking what changes will be seen in the future, we must ask whether an editorial staff is willing to abandon current prejudices and preconceptions and allow some modest experimentation in style. Editors of electronic publications must answer this question publicly, announce their intent to allow new styles, and adhere to this decision at all levels of the editorial and review processes. I have not seen this level of commitment to date; I am hopeful that it may be shown in the future.

I agree that the strength of electronic publication lies in the ability to give access to more information in each paper than is currently possible. However, having this capacity does not necessarily mean we should increase the length of each viewed article. In fact, the top-level view of an article may actually decrease with optional and enhanced information lying a “layer” below, easily accessible but benignly invisible until it is required. Readers interested in a top-level view should expect to find a clear and straightforward Abstract, Introduction, Results, and Discussion, while those desiring more information need only click to prowl through all the gory details of the Methods and to double-check every nucleotide in a gene sequence. Included in this 2nd layer should be information that will aid in transforming the scientific article from a static corpus relating a single set of observations to an active and interactive gateway to further information on a topic through extended background and reviews, other related articles, cited references, database entries, notes and supplementary data added in proof, and author home pages. Rather than requiring a reader to progress linearly through an article to find the message that the author wanted to convey, appropriate hyperlinking to scientifically relevant data sources will allow users to follow their own thoughts and interests in tangential and creative directions that best suit individual learning processes.

Q: Will authors need to modify their approach to write effectively for electronic publication or communication?

Stapleton: Yes and no. Authors will have to adapt their style and learn new techniques in writing. There will be a premium on good writing to take advantage of the chunky nature of the Web page. Rather than the majestic progress from historical scene setting through hypothesis to experimental design and an inevitable result, authors will need to compose their papers in sections and work hard to bring out the real meaning and significance of their work. I am not saying that we do away with peer review, refereeing, and exhaustive scrutiny of the papers. Academic rigor will, indeed, become more important, but authors will need to learn to exploit the full potential of the Web. Experimental data? Just link the paper to your own Website, and referees can read all your raw data themselves, check out your statistical manipulations and look at graphs until their coffee goes cold. References and bibliographic data? A hotlink to your own database from within the paper will save you assembling specific lists for each paper. Introductions? Historical framework? Make it as long as you like. The limit is the storage space available on your server.

Mayall: Yes, effective electronic publication and communication require a new approach to scientific writing. Historically, the written word has been the analog of the spoken word. Speech is a linear sequential process, with a beginning, middle, and end. Unlike most literary works, the scientific paper already tolerates more flexibility so that it does not have to be read in its printed sequence. The Abstract and Conclusion often will be read first; followed by the figures and tables; then the Introduction, Results, and Discussion; finally, the Methods and the citations may be consulted if needed.

Electronic publication frees authors from the constraints of print. A linear sequence is no longer essential. Readers of electronic articles can and will follow hypertext links according to their fancy; they assimilate information both rapidly and very intensely. Well-designed electronic publications recognize and exploit their inherent difference from the printed medium. Screens are linked sequentially, as in print, but also in parallel with multiple cross-links. Each page is autonomous but highly integrated with the rest of the publication in a way that is not possible with print. Thus, the manuscript has to be broken down into many screens, often containing only one or a few ideas, which need not be presented as paragraphs or even sentences!

It may be that the standard scientific communication will be little more than a thoroughly annotated electronic abstract, with figures and tables. Hypertext links provide access to other parts of the article; more exciting is the link to relevant parts of citations. Why repeat an already published method? Just link!

As the electronic paradigm evolves, we may see true hypertext publication online. An article reports a study, postpublication discussion is encouraged, the author reports further modifications of the study, and so on. This may avoid the problem of minimum publishable units, but it may not satisfy needs for authorship.

McGee: Electronic publication will require a very different approach to writing and to the development and learning of new skills, hardly an inordinate challenge to scientists who continually learn new techniques and find ways to apply those skills to do better research. All of us have experienced frustration as we wade through poorly crafted, needlessly cumbersome sentences to determine just what an author is trying to tell us. Part of this difficulty lies in the language gymnastics required by the passive voice 3rd-person style in which much of the literature is written. An equal part is almost cer-
tainly due to the poor writing skills that many scientists bring to the literature. To facilitate reading on a computer screen, scientific writing should become lean, focused, and journalistic. Authors should not be constrained by the passive voice when attempting to illustrate the logical path they took in their experimentation or to highlight the unexpected results. We may even see data described as "unexpected" or "surprising" instead of the now-ubiquitous "novel results".

As new styles emerge and authors experiment, the role of the editor will become more, not less, important to ensure that the professionalism and accuracy of scientific literature is not lost in vernacular writing.

Q: How do we train scientific authors to write for the new media?

Stapleton: We have 2 clear populations to consider, the before-Web scientists and the after-Web scientists. There is less worry about the latter, who are busily teaching themselves the basic elements of Web writing as they zap around their favorite sites. Teaching basic writing skills in any degree or graduate course, supplemented with advanced Web skills, will still be required. That, coupled with the familiarity that today and tomorrow's students will have with the Web, should be a good start. It also will be very important to inculcate the principles and ethics of scientific writing and publishing, as ease of access to raw data will increase the possibility of fraud. There will be no substitute for the traditional careful editorial attention so beloved of journal editors.

The scientists working before the Web took off may have to go back to school. Even though previously they wrote well, most of them will need some radical training in Web work. Electronic techniques are developing so fast that continual retraining may be essential. Only the flexible and retentive will survive. But that is not so different to normal scientific practice. You can't stand still in the scientific world, and the Web is only speeding things up.

Mayall: Initially, they still must be trained to be competent scientific authors for printed text; there is no substitute for clear and logical thinking. Then they must learn how to exploit the potential of electronic communication. A few simple skills come to mind.

Currently, there is no answer to this question because we cannot define exactly what we wish to achieve by "training" in this new medium, nor do we know who will be the "teachers". As with most learning experiences, the best training is by doing. Even then, what criteria do we have for success? What are the guidelines for a "good" electronic communication? We know what does not work, but can we define what will work? This sounds like a major challenge for a CBE committee!

McGee: I think a better question is, How do we convince authors to stop using the archaic sentence structures and approaches that they now feel are required in scientific writing? Authors will not adopt new styles if they feel that using them will result in rejection. I clearly recall being instructed to read several papers from the journal to which I was submitting a manuscript. This familiar advice is supposed to help an author write in the style favored by a journal, but it discourages change in writing style. Authors must be made aware that they have the option of experimenting with new writing styles that they think will preserve the integrity and professionalism of the science being presented. For a time, many authors writing for the new media probably will continue to write in the traditional journal style, but a few authors will experiment if they are encouraged to do so. Some of these experiments will fail, and the papers will be rejected in the review process for being written in an unprofessional, inappropriate style. Other papers will succeed, and those styles will be noted and built upon by others. Authors, like many of us, learn by example, and presenting a few good examples will encourage others to learn. Additionally, the editorial staff of the electronic publication should encourage authors to include references to Internet resources to enhance their research articles as well as to meet certain standards of scientific relevance. Few biological chemists would argue that hyperlinked references to entries in Genbank or the Brookhaven Protein DataBank are inappropriate or irrelevant, but what about references to supplemental data hosted on a personal Web page? The key role of the editor is to tell authors what is expected, give examples, and ensure that these standards are applied uniformly.

“Style is a result, it can never be an objective. When style itself becomes the objective, nothing results but a copy.”

—Alden Dow, architect, in How to Avoid the 10 Biggest Home-buying Traps