Viewpoints and Letters to the Editor are published in *Hort-* comments on matters of concern to horticulturists. These are Science to provide members of the American Society for Her- not statements of official Society policy nor do they necessar- ticultural Science an opportunity to share their experiences and ily reflect the views of a majority of the Society's Members.

Some Thoughts on Professional Horticultural Publications

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The organizing committee of the Northeast Section of ASHS asked that I discuss scientific publications as part of the mini-symposium "Communicating Horticulture in the 90's." The obvious question is, Why publish anyway? Research itself is great fun, while writing is desperately dull and very painful. Deans don't read journal papers, they merely count titles. There are more articles published per year than can—or need to be—read, and leadership in societies usually depends more on political acumen, volunteering for committee work, and attending business meetings than on one's scientific accomplishments.

Claude Bernard (1875), the 19th century French physiologist, said that there were three parts to conducting research: formulating the problem, doing the research and, to complete the process, communicating the fruits of your discoveries to your peers. Thus, scientific communication is an obligation to the community of scholars to which you are privileged to belong.

Many of you are scarred veterans of the publishing game while others are raw recruits. But when manuscripts come across the editor's desk, all are viewed with the same deep suspicion that the author doesn't know the English language, that the manuscript will be a mess, and that the author has completely ignored the published instructions to authors. And the editor's worst fears are justified in well over 50% of the manuscripts received by any journal. Some journals are now rejecting out of hand any manuscript that is not in the format used by the journal, that looks like a cat has slept on it, or those from authors whose mastery of the language would be unacceptable to a teacher of fifth grade. I have reviewed manuscripts from members of the National Academy of Sciences that I would not have

accepted from a college freshman.

Here then, is the first rule of getting a manuscript *published*—*follow the rules very, very, very carefully*. As one who has done considerable editing, I can't stress too strongly the matter of submitting a manuscript in precisely the format prescribed by the journal. You expect this of your graduate students, why not of yourself? At each stage, check out the *Instructions to Authors*. How many indents to start a paragraph? Is there a comma after the name of each author in the *Literature Cited*? Are decimal points lined up in the tables? Is the *Acknowledgement* on a separate page or is it a footnote? Yes, all these and many more seemingly petty details are boring, but if you don't care about clean, precise communication, why should an editor or reviewer think that what you have to say is worthwhile publishing?

Grammar and syntax, too, should be gone over carefully. "That" vs. "which," present vs. past tense, the dangling participle, the incomplete sentence or clumsy phrase construction, even if they slide by the editor and reviewers, will greatly reduce your ability to communicate your findings to the reader. I'd be surprised if you hadn't, like I have, simply passed over a published paper when it was so badly written that you couldn't understand what the author was driving at. And if it is your paper they toss aside, what was the point of all your hard work? Claude Bernard would be appalled!

Illustrations and their headings are always a problem. Everyone tells you that a heading and legends should be freestanding, whatever that means. Basically, these headings and legends should allow the reader to understand the data presented in the illustration. Skimpy legends and headings don't save space, they just create confusion. Better to have too much than too little information; the editor and reviewers will cut the excess if necessary. The clarity of the illustration itself is up to you. A good trick for photographs is to view them through a piece of window screening; if what you want to show is obscured, the photo is not sharp, lacks contrast, or there is too much extraneous background. Don't be fooled into thinking that a color slide will easily be transformed into a sparkling black-and-white print. You will invariably lose definition. Remember that

figures will be reduced on the printed page, and a photo that looks good at $\times 1$ may be blurred at $\times 1/3$. Haven't you seen histograms where the bars have almost fused together or there are six curves on one graph and you can't tell which line is which? The Shaker hymn sings that it is a gift to be simple. This dictum applies with equal force to all illustrations. Really good graphs, histograms, and photographs almost leap off the page. You have, with such illustrations, communicated. Claude would be pleased!

These are, of course, matters of merely following rules that have been developed over time to make life easier for the reader. Journals have established formats so that the reader is programmed to read the published papers quickly and accurately. The rules should have been mastered during the first year of graduate school, and I am embarrassed that they are still such a headache for editors and reviewers. We all have the responsibility of ensuring that our students do the right thing; this is best accomplished when we turn out papers that our students can use as shining examples and, equally important, when we require our students, undergraduate and graduate, to write frequently, with us serving as strict taskmasters. We have the same responsibility to teach correct prose as do members of the English Dept.

You have, as have I, read papers that seem to bubble as the text flows and others that clump along like a worn-out, spavined horse. There isn't any book that can teach how to write. It's working away at a sentence until it rings and then going on to the next one and the next one and then deleting and starting over again. Almost without your knowing it, you will develop a style and the next manuscript just may be a tiny bit better.

When you read next month's issue of *HortScience* or any journal article, try recasting sentences written by your peers and see if you can reorder and improve the text. Do this conscientiously, as if you were reviewing the manuscript for publication. Many of your professional colleagues are wonderful writers, and, while you may not want to emulate their styles, you can learn from them. Reread your own papers and think about how you would improve what you may have said 5 years ago. Yes, it's deflating to have to say, "My Lord, how could I have written

Received for publication 11 Feb. 1991. Presented at the 1991 annual meeting of the Northeast Section of ASHS on 10-12 Jan. 1991 at the Univ. of Vermont as a contribution to the colloquium, "Communicating Horticulture in the 90's." Preparation supported by the Vermont Agricultural Experiment Station. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

such a horrible sentence!", but your next manuscript won't contain the same pratfall, although there will likely be a different one. In the process, you will have improved your ability to fulfill your mandate to communicate information to your peers. Claude Bernard would be delighted!

Many years ago, as a graduate student, I spent a summer at the Marine Biological Laboratory at Wood's Hole, Mass. It was a wonderful experience. Breakfast at 7 AM, lectures until noon, lunch, and then laboratory until 6 PM. Supper was followed by more lab work and we usually adjourned about 10 PM for a pitcher of beer and fried clams at a rather unsavory bar. There were seven Nobel Laureates in residence and I worked with two of them. One was Otto Warburg who, when informed that he won the Nobel, commented that "it's about time!" One night, about 3 AM, when we were working on the quantum efficiency of photosynthesis, he said to me, "You know, when I write a manuscript, I go over it many times until the addition or the removal of a single word would change my meaning. I do this because I know that any paper I write is so important that it will be read all over the world, and I must be sure that no one misunderstands what I am telling them." (All this was said in German, because Warburg would never lower himself to speak English to a mere graduate student.) And what he told me was true; his papers were exciting and absolutely clear. I have never succeeded in fully emulating his wonderful economy and precision, but I try. You, too, must believe that what you write is important and that your papers will be read by people whose native language is not English. If you keep this in mind, you'll think very seriously about fuzzy phrasing, poor grammar, and sloppy sentences. Every time one of your papers appears in a journal, your personal reputation is on the line.

The matter of *who constitutes your audience* must be considered. Even within a single issue of the *Journal of the American Society for Horticultural Science*, there is a great diversity of topics. Most reports are written specifically for a rather restricted audience. The pomologist may have little background in ornamental flowering plants, and the photosynthetic quantum efficiency of a begonia leaf under water stress is not likely to be the cup of tea for someone working in tomato genetics. If you are to truly communicate, one of your tasks is to put your work in a context that will be understandable to someone working in a field far removed from that of your own research. A sentence or two, right at the beginning of the intro-

ductory paragraph, to clue in and orient the reader and to provide a guide to the specific framework of knowledge into which your work fits is a responsibility of all scientists. Most of us in research, and certainly those of us who teach, need new insights into plant science areas about which we know very little, but about which we would like to learn something. Even if you decide to publish in a highly specialized journal, this "big picture" introduction is invaluable. You will have communicated to all of your peers, and Professor Bernard would nod in approval.

Although most of my own research is now in forest decline, I still maintain a program in photobiology. Because of this interest, I look very carefully at the information on light presented in the *Materials and Methods* section when I review a manuscript. I have found that <30% of these manuscripts give all of the pertinent information. Light quality, quantity, and duration are usually presented incompletely or contain obvious errors to the point where no one could repeat the study. I usually recommend acceptance after revision, but some manuscripts are so deficient that I recommend rejection. Of course, I am sensitized to adequate presentation of radiation data, but other reviewers and members of the audience for your paper maybe cranky about precise presentation of information on soil, seed sources, temperature, and other important technical manipulations. In addition to chancing rejection of your manuscript, were it to be published with inadequate, unclear, or just plain wrong information, you will have done your profession a disservice and messed up the literature. Claude would certainly not be at all happy!

Dating from our 2nd-year of high school science, the idea that science and scientists are somehow different from ordinary life and ordinary people has been inculcated in all of us. Science is, we are told, objective, "just the facts," and oblivious to those unquantifiable beliefs that might cloud judgment. And our professional education tends to reinforce these beliefs. Accordingly, speculation, going beyond one's data, is to be shunned as fervently as even thinking about sin. I assert that this attitude does more harm than good for scientific progress. Of course, hard numbers are objective, assuming that the design of the experiment and the manipulations are adequate. But interpretation and evaluation of data depend on the past scientific history of the investigator, the current state of knowledge within a field, and those unquantifiable beliefs, impressions, and biases that accumulate through living in this vale of tears. The capacity to make mental cor-

relations that extend beyond available information and insights that can provide a new or different dimension to phenomena are, to my way of thinking, a magnificent attribute of the human mind. And when that mind has been honed by storing collections of information, as in plant or other science, the leap into the dark can profoundly influence the direction of scientific thought. All this philosophical meandering is germane to the preparation of the *Discussion* section of your manuscript. It is here that you are free to make correlations among research from various laboratories and even from diverse areas of science to suggest new approaches to thinking and, by so doing, reach conclusions that bring fresh perspectives to your own and other fields of inquiry and focus attention on problems and solutions. In Theodore Roosevelt's words, the *Discussion* is "a bully pulpit." There is, I admit, some undefinable limit to how far you will be permitted to stick your neck out, and the executioner's ax wielded by an editor or a referee may descend very quickly. But it is usually worth trying.

I would like to say something about *shared authorship*. I have always believed that I would not be diminished by leaning over backward to recognize the work of others. Papers from my laboratory have included the names of technicians, graduate students, and even undergraduates. Even if their input was small, it doesn't detract from the manuscript to recognize their contributions and, for students aiming to become professionals, a publication record is very valuable. It's also the nice thing to do. I make it a practice to circulate manuscripts to all of the crew and rarely fail to get useful suggestions. After all, these are obviously very bright people, as evidenced by the fact that they chose to work with me.

In making his statement about communication, Claude Bernard didn't claim that there is any easy route to writing well, nor will I. A colleague with a distinguished record of publication once told me that every word is a drop of her blood. Yet, a paper of lasting value is not just a technical achievement in writing, it is also a personal victory won at considerable intellectual cost. And isn't it something of a thrill to open a journal and see that what you did has finally come to fruition?

Literature Cited

Bernard, C. 1875. Introduction à l'étude de la médecine expérimentale. Masson et Cie, Paris.