SCIENTIFIC WRITING = THINKING IN WORDS

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I do not mind if you think slowly.
I do mind, however, if you publish more quickly than you think.
—Wolfgang Pauli

At some point in their careers, most scientists discover that they're not only hypothesis testers and empirical observers but, in fact, writers. For the lucky, this discovery comes early, in a university science course where the professor assigns papers to be written in scientific paper format. For the less lucky, the discovery comes only after writing dozens of grant proposals and scores of papers, including rejected ones. Eventually, most scientists come to agree with Australian author David Lindsay, editors of virtually every scientific journal, and even character actor Stephen Tobolowski that "Science is not science unless you write down what you find."

Easier said than done, of course – which is where this book comes in. If you read nothing but the pulled-out quotations set in large type throughout the book, preferably in order, you will already have a pretty good sample of the fundamental principles of effective scientific communication. In the book's three main sections – "Thinking about Your Writing," "Writing about Your Thinking" (the heart of the book), and "Thinking and Writing Beyond the Scientific Article" – Lindsay explains how to apply these principles in formal journal articles, posters, oral presentations and theses.

Early on, Lindsay sets forth his core message: that a sound, well-structured scientific article "depends on a well-reasoned and clearly stated hypothesis." In the book's first section, Lindsay makes a basic case for why scientists must write and tries to calm scientists' fears that scientific writing is the very antithesis of what they know how to do. On the contrary, he argues: writing a paper is like doing the science itself. Both require planning for results, reasoning, presenting the results, and explaining the results; if you are clear and focused in how you think about your research results, you're in a good place to start writing about them.

In the second section, Lindsay takes you through the divisions of a standard research paper – Introduction, Materials and Methods, Results, Discussion, Summary, and "other bits" – and steps, including editing for readability and style, for getting a paper published. The book's last section offers "ways to cope" with reaching audiences other than readers of journal articles. Each section contains many helpful writing and presentation strategies, from presenting your most important research results first to how to arrange data within a table so that readers can most easily see a meaningful pattern, not just rows of numerals. Perhaps most helpful to the scientist-writer who has managed to write the first draft of a paper is a checklist on "editing for style and fluency" (p. 70).

Despite its load of good advice, helpful checklists, and a downright funny makeover of a poster presentation on piglets (pp. 93–94), I found myself annoyed when reading this book. To be fair, my complaints center primarily on style rather than substance. For one, I find the analogy between an article's soundness and a well-reasoned hypothesis singularly unhelpful, particularly for marine ornithologists, who seldom base their research on conventional experimental hypotheses. Lindsay is really saying that an article should give its readers some reason to care about the topic: What are you telling me? Why should I care? Why would I keep reading? In other words, what's the point? I wish he'd just said that, instead of "So, there is little doubt that no other single statement in your paper is as important as the hypothesis . . . whatever you call it" (p. 24).

For another, Lindsay buries at the end of "Writing about Your Thinking" (pp. 64–70) the best writing advice for any profession: write in a way that matches how a reader reads. This advice comes from research in reader perceptions that was lucidly explained for scientist-writers in a 1990 article in *American Scientist* by George Gopen and Judith Swan; this article should be required reading for every scientist. The essence of the advice is that readers grasp information best when it begins with something they already know and builds bridges from old information to new information. In a piece of writing, this old-to-new principle means that every word needs to link to previous words within a sentence, which in turn needs to link directly to the next sentence and subsequent sentences in the same paragraph, which needs to link to the next paragraph and the next, and so on. These linkages build coherence, and, without them, readers lose their way fast.

My other complaint has to do with punctuation, usage and style. Editors are notorious for arguing over such matters, and I'm no exception; moreover, as a scientific and policy editor following American rules of punctuation, I may trip where Australian and Commonwealth readers would not. Still, I was annoyed by commas at every turn of phrase, as if dispensed from a shaker, even between subjects and verbs ("Despite the best of intentions, complying with the techniques of using size and position to convey impact vicariously, may not be always possible" [p. 44]). As this example illustrates, the author's own prose doesn't always float weightlessly off the page either. And why do so many sentences start with the tiresomely indirect "There is" or "There are" and contain so many variants of the verb "to be"? What happened to lively, vivid verbs and simple declarative sentences? This book is devoid of the love of language exemplified in so many other books on writing – even scientific writing.

All in all, though, this book is a handy guide for scientists anywhere in their careers who have not consciously recognized the positive feedback loop between thinking about science and writing about it. Writing is rarely easy for anyone, and it's never too early or too late to learn.

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