More Fun Than Fun: Scientists Must Write for the People

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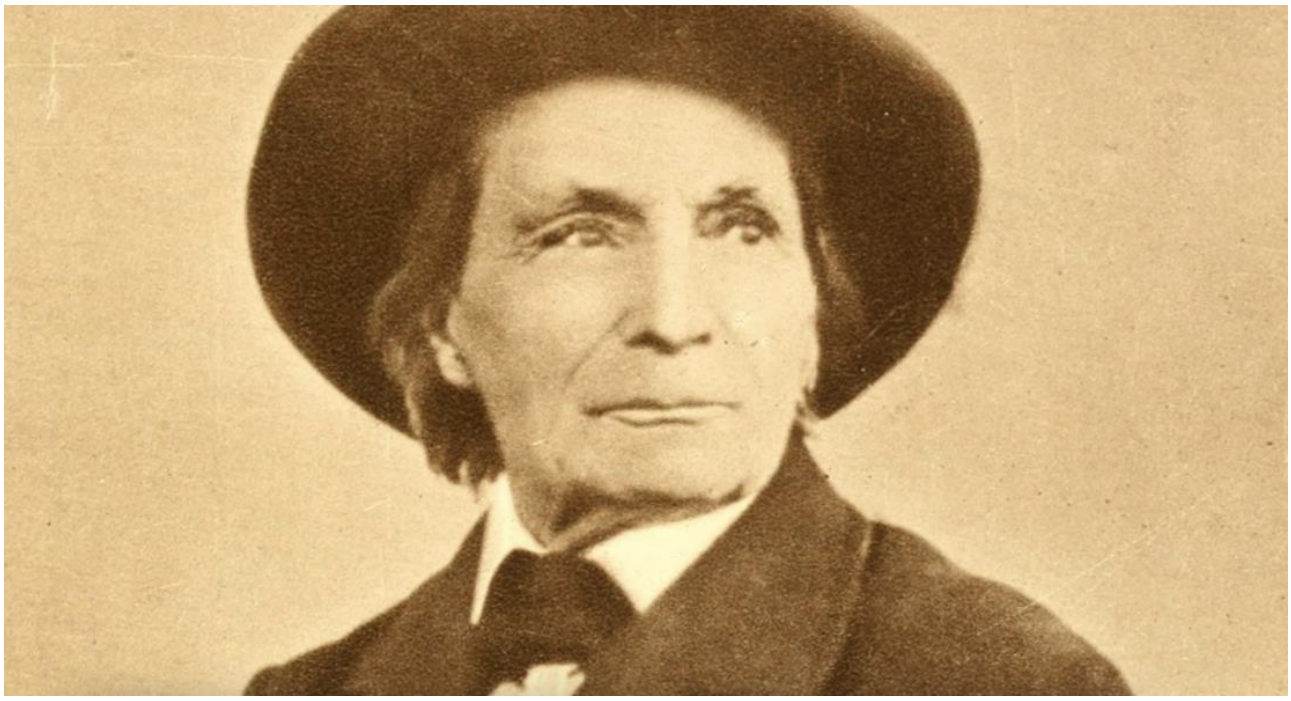


French entomologist and belletrist Jean-Henri Fabre (1820-1910), whom Charles Darwin called the 'Homer of entomology'. Photo: Public domain

RAGHAVENDRA GADAGKAR

This article is part of the 'More Fun Than Fun' column by Prof Raghavendra Gadagkar. He will explore interesting research papers or books and, while placing them in context, make them accessible to a wide readership.

My former student Anindita Bhadra recently invited me to speak to the participants (MSc and PhD students) of a workshop on science communication that she had organised under the auspices of Cogito 137, a multilingual web-based science communication platform hosted on the IISER Kolkata web domain. I am no expert on the theory and practice of science communication (many experts spoke during the workshop) but I agreed to speak because I have one point to make.

Today, we see an increasing division of labour between scientists who are content with producing knowledge and science writers who are content with communicating this knowledge to a broad audience. We justify this separation as inevitable because science has become so complicated that scientists have neither the time nor the skill required to speak to the general public. For the same reason, science writers have neither the opportunity nor the skill required to produce knowledge. While this may be inevitable to a small extent, I worry that scientists are using the supposed complexity of science as an excuse to shirk responsibility and exaggerate the division of labour more than it is necessary.

There should be no division of labour

In an ideal world, there should be no division of labour between scientists and science writers. Scientists should not entirely leave communication to the public to science writers any more than the latter can leave knowledge production entirely to scientists. The joy of communication should be an important driver of knowledge production, and the joy of knowledge production should be an important driver of science writing. To come close to realising this dream, we need a paradigm shift in the culture of science.

Scientists cannot be satisfied merely with producing knowledge; to experience the full glory of their craft, they should become effective communicators as well. But how do we bring about this change in scientists? To start with, scientists should have the desire to write well. We should make writing in style a matter of prestige. Surprising as it may seem to non-scientists, this is not usually the case. A friend of mine used to say that many scientists have "the fear of being understood", as if they would lose their exalted, almost magical, reputation in the eyes of the public.

In introducing the Canto edition of *The Two Cultures* by C.P. Snow, Stefan Collini, a professor of intellectual history and English literature at Cambridge University, has described our predicament well:

> "In many forms of experimental science, writing plays no really creative role: it is not itself a process of discovery, as it is in the humanities, but an after-the-event report – 'writing up', as the idiom revealingly has it. Accuracy, clarity, economy are certainly required in the presentation of results, but arranging one's findings in intelligible form is regarded by many research scientists as something of a chore … Elegance of style tends not to be cultivated or prized as a professional ideal, though individual scientists may cherish it. But in many humanities subjects, not only may the most creative thinking be done in the very process of writing, but the manner in which a book or article is written is itself the chief embodiment of the level of understanding that has been reached."

I agree. For instance, we never hear one scientist tell another, "Oh! I read a paper in *Nature* last night; it was so well written." If we indeed make such a remark, it will likely be construed as a backhanded compliment, suggesting that there was not much substance in the paper.

But we must reform the world of science so that Collini's description is no longer accurate.

How can we do this?

I have some pet ideas. We must read voraciously and indiscriminately. Unless we read the good, the bad and the ugly, we will not become discerning readers and good writers. We should also help ourselves to a generous dose of fiction. Besides exposing us to style better than non-fiction can ever do, fiction will help us develop our ability to imagine. Imagination is crucial in science, essential for proposing hypotheses, conducting thought experiments, and anticipating the implications of our theories. Imagination is also a critical ingredient of the skill set required to enter into the mental world of uninitiated readers and help them understand complex scientific concepts.

Unfortunately, it is surprisingly common among scientists, especially among science students, to treat – or be admonished to treat – the reading of fiction as a distraction or entertainment, not helpful in furthering the pursuit of science. Thus, when I ask my undergraduate students what books they have read, they usually mention fiction rather apologetically.

But it is not enough to read for the sake of content. We must pay specific attention to style, even temporarily ignoring content if necessary. And we must rank what we read in terms of style and articulate our reasons for the rankings so that we may develop our own unique style and not just write like someone else.

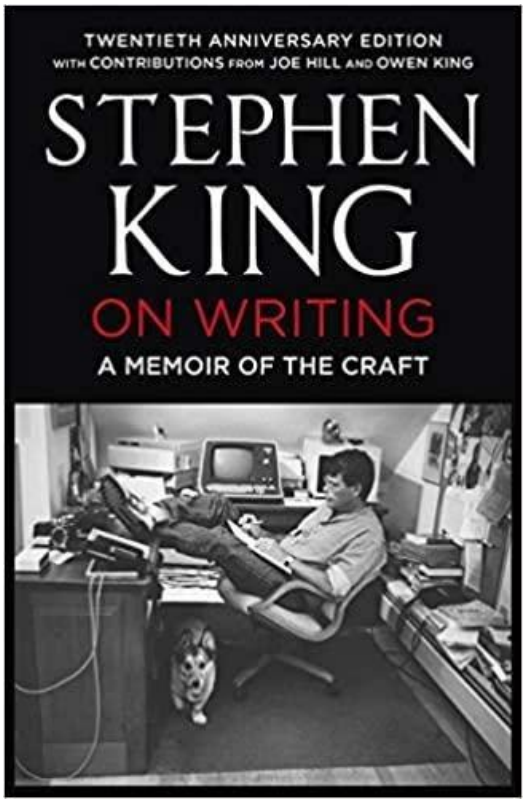
Seek (and flout) advice

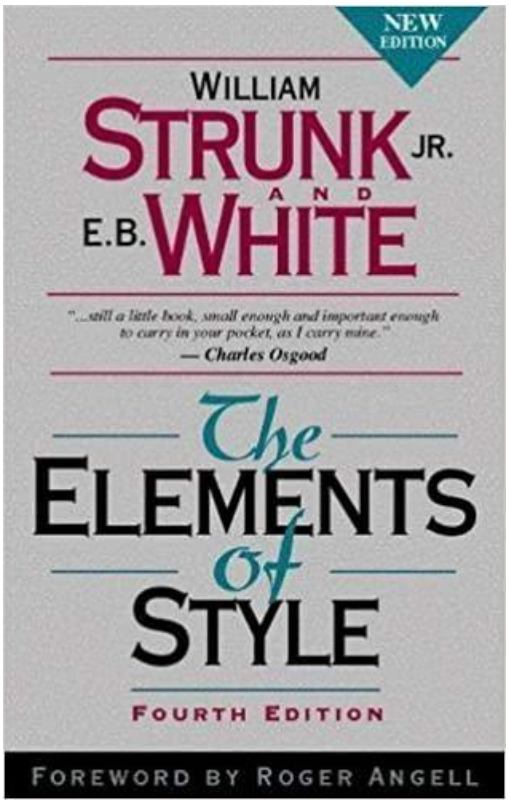
To learn to write well, we must unabashedly consult guidebooks. But our goal should not merely be to follow their advice. Instead, we must read, understand and experiment at flouting the advice given, and see the consequences, much like doing a controlled experiment.

There are innumerable guide books for writing, but if the goal is indeed to read, understand, and try to flout, then any will do. But I would recommend starting with the mother of all guides, *The Elements of Style* by Strunk and White. The history of 'Strunk and White' as told by E.B. White is fascinating:

> "At the close of the first World War, when I was a student at Cornell, I took a course called English 8. My professor was William Strunk, Jr. A textbook required for the course was a slim volume called *The Elements of Style*, whose author was the professor himself. The year was 1919. The book was known on the campus in those days as "the little book," with the

stress on the word "little." It had been privately printed by the author. I passed the course, graduated from the university, and forgot the book but not the professor. Some thirty-eight years later, the book bobbed up again in my life when Macmillan commissioned me to revise it for the college market and the general trade. Meantime, Professor Strunk had died."





On May 29, 2020, I listened to Gilbert Cruz on the *New York Times Book Review* podcast. Having read all of Stephen King's 70 novels, Cruz is a veritable King aficionado for the *New York Times*, and for us. So I was tickled that in a programme meant to answer the question "Want to read Stephen King but unsure of where to start?", both Cruz and the podcast host Pamela Paul agreed that their best King pick was not any one of his novels but his non-fiction book, cunningly titled *On Writing: A Memoir of the Craft*. The title permits King to give us a triple treat – an account of his eventful personal life, an account of what it means to be a writer, and surprisingly detailed and exacting advice about the craft of writing. Reading it, I thought that defying King's advice on writing with confidence would be a sure road to success.

I was vindicated two weeks later, when I listened to the *NY Times Book Review* podcast of June 12, 2020. As I have recounted in the very first edition of this column, Stephen Fry came on this podcast and, after praising King's advice on spare writing, to strip away all adverbs, etc., went on to say, "I have tried to do that with my writing, but no, it's no good… this is the writer [I am] and if people think it's overwritten… over florid, then so be it, they will have to put the book down and turn to someone [else]".

Another of my favourite 'advice' books is Steven Pinker's *The Sense of Style: The Thinking Person's Guide to Writing in the 21st Century* (2014). Being a psychologist, a linguist and a superb writer, Pinker is well-placed not only to give advice on writing but to show us the logic behind the advice, paving the way to flout advice with justification. Pinker's book is meant to be read from cover to cover and then to go back as often as we (should) go to a dictionary. But above all, scientists must imbibe Pinker's philosophy about writing:

> "Style not least, adds beauty to the world … To a literate reader, a crisp sentence, an arresting metaphor, a witty aside, an elegant turn of phrase are among life's greatest pleasures … this thoroughly impractical virtue of good writing is where the practical effort of mastering good writing must begin."

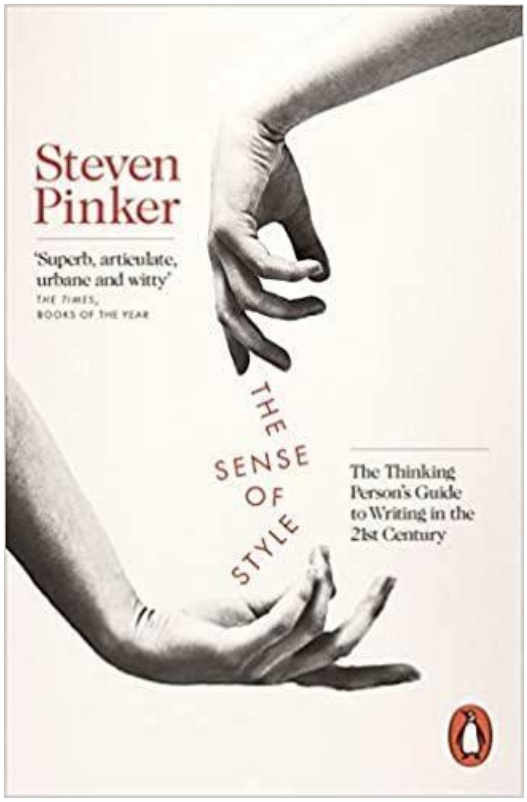
I could scarcely believe it when a friend told me that Umberto Eco, the Italian polymath, probably best known for his unforgettable philosophical novel *The Name of the Rose* (1994), had written a book called *How To Write A Thesis* (1997/2012). I now rate it as the finest 'advice' books I have read. On the face of it, Eco's advice is for students in the humanities living in the age of index cards, notepads and inter-library loans of printed books. But I think natural scientists in the age of the internet, Web of Science and Google Scholar will be wise to read it. In the guise of advice on 'how to write a thesis,' Umberto Eco gives us much advice on how to 'do research'. It is this disguise that first appealed to me. But then I realised that for Eco (and for students in the humanities), 'write your thesis' actually means 'do research'!

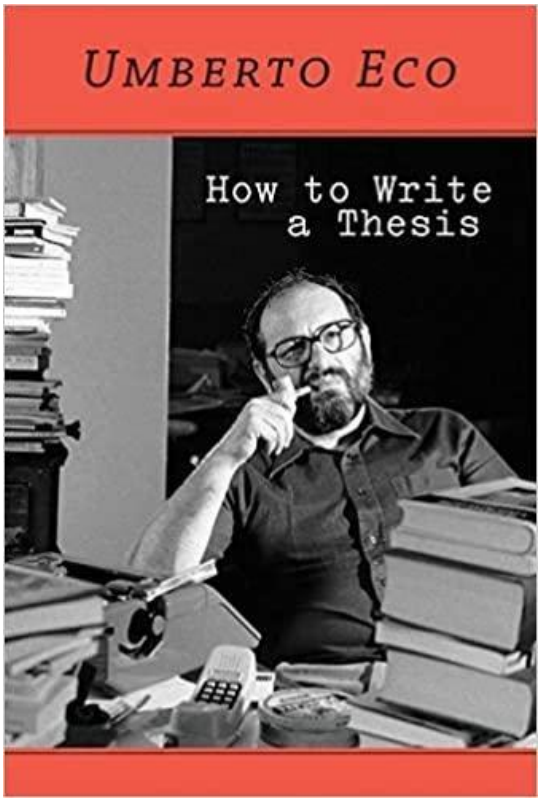
Can we import some of this humanities mojo into the world of the natural sciences?

No trade-off between form and content

Scientists must realise that there is no trade-off between form and content. Richard Dawkins makes this point well in his recent *Books Do Furnish A Life* (2021). A highly readable collection of Dawkins' previous writings, the book includes a surprisingly large number of introductions, forewords, afterwords and reviews that he has written for other people's books. The books that are the objects of these essays are scientific monographs, popular science books, science fiction or books about religion and God. I love this genre because it is free from the strict rules that are often imposed on more technical, scientific writing – rules that frequently and unnecessarily diminish the quality of the prose. The essay format, so infrequently encountered in scientists' writing, is a great tool to improve our writing.

But I am always surprised at how much scientists in positions of power disparage this genre on the mistaken ground that it does not represent new knowledge. I have served on many selection and evaluation committees and been dismayed when all items in this genre are expunged from the list of publications of the people being assessed. Sometimes bureaucrats provide this 'service' even before the committee has had a chance to see them. And of course, we have got rid of the essay format in student assignments in favour of multiple-choice questions. As a result, today's students will never know the joy of crafting an essay by finding out everything they can about a topic. Here's Dawkins again:



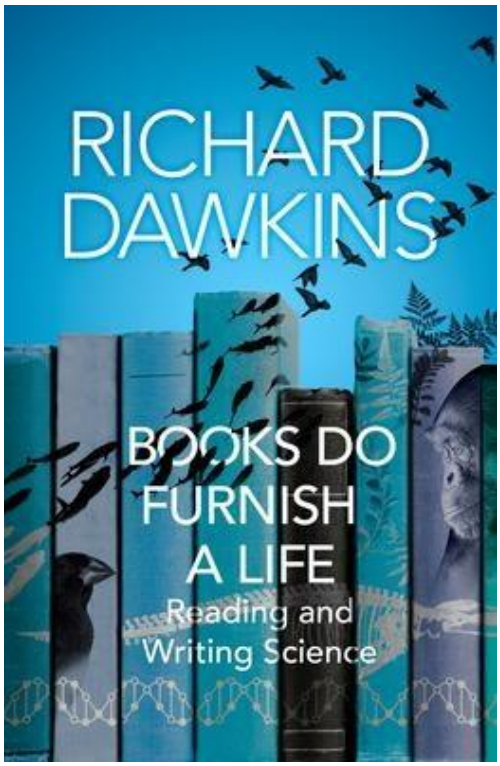


> "I remember the bare facts about starfish hydraulics but it is not the facts that matter. What matters is the way in which we were encouraged to find them. We didn't just mug up a textbook: we went into the library and looked up books old and new; we followed trails of original research papers until we had made ourselves as near world authorities on the topic at hand as it is possible to become in one week. The encouragement provided by the weekly tutorial meant that one didn't just read about starfish hydraulics, or whatever the topic was. For that one week I remember that I slept, ate and dreamed starfish hydraulics. Tube feet marched behind my eyelids, hydraulic pedicellariae quested and sea water pulsed through my dozing brain. Writing my essay was the catharsis, and the tutorial was the justification for the entire week."

The Department of Science and Technology of the Government of India, which generously supports my research and to which I, therefore, gratefully report my scientific output, does not admit any mention of this genre (of which I have many) on their online platform.

At the editor's invitation, I recently had the great pleasure of writing the foreword to the *Encyclopaedia of Social Insects*, but the publisher (Springer Nature, no less) refuses to list it in the table of contents in their online edition. My essay is well and truly buried!

What is scientific literature (or what it ought to be)?



Dawkins introduces his collection of essays by recalling the two meanings of the word 'literature' from the Shorter Oxford English Dictionary.

a. That kind of written composition valued on account of its qualities of form or emotional effect.

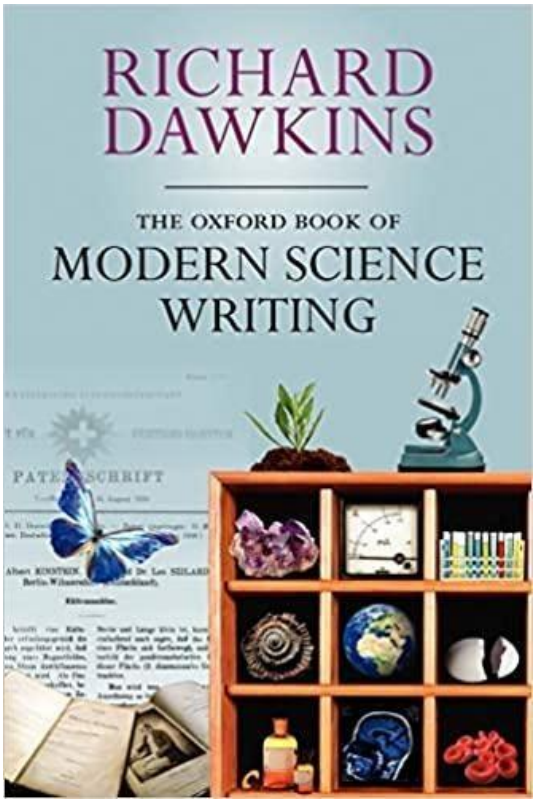
b. The body of books and writings that treat of a particular subject.

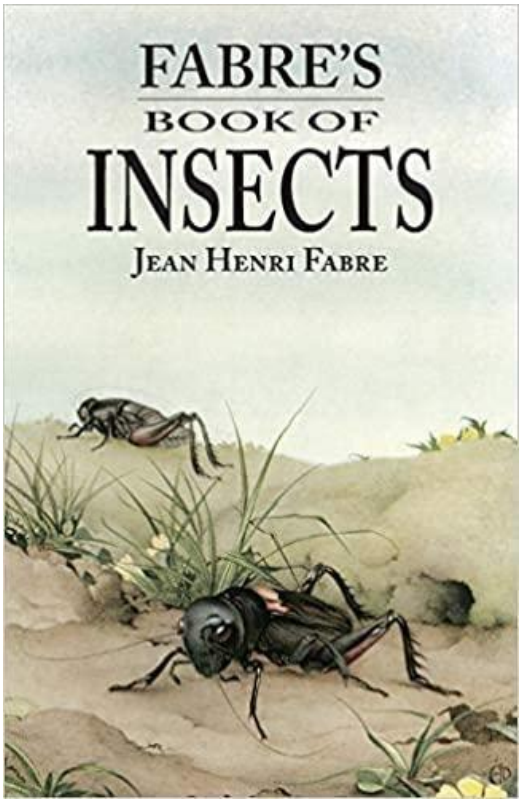
And goes on to say:

> "'The' literature, for a scientist, is all those papers, often abstrusely and densely written, which pertain to a particular research topic. …
>
> "By 'the literature of science' in this essay, I mean something closer to the 'a' definition from the OED above. I am talking about science as literature, good writing on the theme of science. This usually means books rather than scientific journals. As an aside, I think that's a pity. There's no obvious reason why a scientific paper shouldn't be gripping and entertaining. No reason why scientists shouldn't enjoy the articles it is their professional duty to read. …
>
> "I feel I have a mission to persuade my scientific colleagues to write their science as if they had a lay person looking over their shoulder, not to write in a language which is completely opaque to other people. I believe they'll do better science if they do that, I think they'll communicate with other scientists better if they do that. I even think they'll understand better the science that they themselves are doing."

Seek role models

Scientists need role models even for writing. Despite my lament that scientists write badly or don't write enough, there are many exemplary role models. Richard Dawkins's *The Oxford Book of Modern Science Writing* (2008) has an inspiring collection of 394 examples from the writings of Martin Rees, Francis Crick, Fred Hoyle, Jared Diamond, Rachel Carson, Edward O. Wilson, Freeman Dyson, J.B.S. Haldane, Jacob Bronowski, Oliver Sachs, Lewis Wolpert, Carl Sagan, John Tyler Bonner, Sydney Brenner, John Maynard Smith, D'Arcy Thompson, Niko Tinbergen, Arthur Eddington, Peter Medawar and 60 more brilliant scientists.





As if that were not enough, Dawkins introduces the collection with a clarification – "This is a collection of good writing by professional scientists, not excursions into science by professional writers" – and a lament: "My biggest regret concerns the number of excellent scientists that I have had to leave out, for reasons of space. I would apologise to them, did I not suspect that my own pain at their omission is greater than theirs. The collection is limited to the English language and, with very few exceptions, I have omitted translations from books originally composed in other languages."

One of my role models is Jean-Henri Fabre (1823-1915), whom I have mentioned before in another edition of this column (and will surely do so again!). A French entomologist, naturalist and writer, par excellence, Fabre has been called a belletrist ("a person who writes essays, particularly on literary and artistic criticism, that are composed and read primarily for their aesthetic effect"), 'the poet of science' and the 'Homer of entomology'. As I read Fabre's *The Book of Insects*, Pinker's words "a crisp sentence, an arresting metaphor, a witty aside, an elegant turn of phrase are among life's greatest pleasures" ring in my ears, loud and clear, and make me want to write.

An ideal world

Some years ago, I dreamt of an ideal world. I often do so in private, but this time it was in public. In my ideal world, there was no need for science communicators as distinct from scientists. The producers of knowledge were able to successfully communicate their findings to all of the rest of the world. Indeed, they were able to do so better than anybody else. And, there was no difference between communicating science through the medium of a peer-reviewed, technical science journal, on the one hand, and through a newspaper article, on the other.

We must try to create such an ideal world. And in the meanwhile, scientists must publish their work three times, first for a technical audience, then for a non-technical scientific audience and finally for a non-scientific audience. I can hear my colleagues saying, "where is the time?" and "writing for the public is frowned upon anyway!"

True. But the culture of science must change and make it possible, nay, necessary, to do small quantities of high-quality science, and devote time, and derive pleasure from better communication. Writing for a wide, non-technical audience must begin long before writing technical papers, continue unabated alongside writing technical papers, and continue long after we stop writing technical papers. We will find that even in the natural sciences, "the most creative thinking [can] be done in the very process of writing." That certainly is my experience.

The role of science writers

What then is the role of professional science writers? We need not entertain the fear that if scientists write well and also write for the general public, they will drive professional science writers out of business. The role of science writers is vitally important, but I would like to see them also as knowledge producers. Science writers should do more than just reporting, more than translating the gibberish of scientists into English or whatever language they may choose to write in.

If scientists do a good job of communicating their science to the public, science writers can concentrate their efforts on creating new knowledge of their own. Science writers are in a much better position to make lateral comparisons, understand the process of science, and detect possible biases and conflicts of interest, something that scientists, being insiders, cannot do very well. So rather than just expect them to clean up our messy prose, we should elevate science writers to the role of knowledge producers.

Science writers should also lace their writing with flavours of the history, philosophy, sociology and politics of science. Here again, the culture of science must change to give prestige to science writers and accept them as knowledge producers, and count them as scientists, perhaps as even more important than scientists themselves. Both scientists and science writers should produce and communicate knowledge, but each one a different kind of knowledge. Such a cultural change will make the pursuit of science a more inclusive and democratic process and expand the boundaries of what counts as science.

Part of the cultural change needed is to stop packaging science as a sophisticated, expensive activity that only a few highly trained, privileged people can undertake. Instead, as we approach the ideal world, the same person should double up as a scientist and science writer, sometimes doing the one (for her own work) and sometimes the other (for others' work).

Prospects for change

What are the prospects for bringing about these cultural changes? I admit that the present scientific establishment is a major stumbling block. But I am heartened to see that, today, young scientists are far more determined and rebellious than in my generation. I know many young scientists today who are not willing to strategise their career paths to adapt to a misguided, un-progressive establishment. Instead, they are willing to attempt to change the world to rather adapt it to their dreams. I also see many highly committed and sparklingly talented young science writers ready to take on any challenge. There is much hope.

If this reads like a manifesto, well, I suppose it is!

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