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Actor Josh Brolin as Llewelyn Moss in the 2007 film adaptation of *No Country for Old Men*, based on the novel by Cormac McCarthy.

COLUMN

Tips from a Pulitzer prizewinner

Van Savage and **Pamela Yeh** share advice from US novelist Cormac McCarthy.

For the past two decades, Cormac McCarthy — whose ten novels include *The Road*, *No Country for Old Men* and *Blood Meridian* — has provided extensive editing to numerous faculty members and postdocs at the Santa Fe Institute (SFI) in New Mexico. He has helped to edit works by scientists such as Harvard University's first tenured female theoretical physicist, Lisa Randall, and physicist Geoffrey West, who authored the popular-science book *Scale*. Van Savage, a theoretical biologist and ecologist, first met McCarthy in 2000, and they overlapped at the SFI for about four years while Savage was a graduate student and then a postdoc. Savage has received invaluable editing advice from McCarthy on several science papers published over the past 20 years. While on sabbatical at the SFI during the winter of 2018, Savage had lively weekly lunches with McCarthy. They worked to condense McCarthy's advice to its most essential points so that it could be shared with everyone. These pieces of advice were combined with thoughts from evolutionary biologist Pamela Yeh and are presented here. McCarthy's most important tip is to keep it simple while telling a coherent, compelling story. The following are more of McCarthy's words of wisdom, as told by Savage and Yeh.

Use minimalism to achieve clarity. While you are writing, ask yourself: is it possible to preserve my original message without that punctuation mark, that word, that sentence, that paragraph or that section? Remove extra words or commas whenever you can.

Decide on your paper's theme and two or three points you want every reader to remember. This theme and these points form the single thread that runs through your piece. The words, sentences, paragraphs and sections are the needlework that holds it together. If something isn't needed to help the reader to understand the main theme, omit it.

Limit each paragraph to a single message. A single sentence can be a paragraph. Each paragraph should explore that message by first asking a question and then progressing to an idea, and sometimes to an answer. It's also perfectly fine to raise questions in a paragraph and leave them unanswered.

Keep sentences short, simply constructed and direct. Concise, clear sentences work well for scientific explanations. Minimize clauses, compound sentences and transition words — such as 'however' or 'thus' — so that the reader can focus on the main message.

Don't slow the reader down. Avoid ▶

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footnotes because they break the flow of thoughts and send your eyes darting back and forth while your hands are turning pages or clicking on links. Try to avoid jargon, buzzwords or overly technical language. And don't use the same word repeatedly — it's boring.

Don't over-elaborate. Only use an adjective if it's relevant. Your paper is not a dialogue with the readers' potential questions, so don't go overboard anticipating them. Don't say the same thing in three different ways in any single section. Don't say both 'elucidate' and 'elaborate'. Just choose one, or you risk that your readers will give up.

And don't worry too much about readers who want to find a way to argue about every tangential point and list all possible qualifications for every statement. Just enjoy writing.

With regard to grammar, spoken language and common sense are generally better guides for a first draft than rule books. It's more important to be understood than it is to form a grammatically perfect sentence.

Commas denote a pause in speaking. The phrase "In contrast" at the start of a sentence needs a comma to emphasize that the sentence is distinguished from the previous one, not to distinguish the first two words of the sentence from the rest of the sentence. Speak the sentence aloud to find pauses.

Dashes should emphasize the clauses you consider most important — without using bold or italics — and not only for defining terms. (Parentheses can present clauses more quietly and gently than commas.) Don't lean on semicolons as a crutch to join loosely linked ideas. This only encourages bad writing. You can occasionally use contractions such as isn't, don't, it's and shouldn't. Don't be overly formal. And don't use exclamation marks to call attention to the significance of a point. You could say 'surprisingly' or 'intriguingly' instead, but don't overdo it. Use these words only once or twice per paper.

TONE IS IMPORTANT

Inject questions and less-formal language to break up tone and maintain a friendly feeling. Colloquial expressions can be good for this, but they shouldn't be too narrowly tied to a region. Similarly, use a personal tone because it can help to engage a reader. Impersonal, passive text doesn't fool anyone into thinking you're being objective: "Earth is the centre of this Solar System" isn't any more objective or factual than "We are at the centre of our Solar System."

Choose concrete language and examples. If you must talk about arbitrary colours of an abstract sphere, it's more gripping to speak of this sphere as a red balloon or a blue billiard ball.

Avoid placing equations in the middle of sentences. Mathematics is not the same as English, and we shouldn't pretend it is. To separate equations from text, you can use line breaks, white space, supplementary sections, intuitive notation and clear explanations of how to translate from assumptions to equations and back to results.

When you think you're done, read your work aloud to yourself or a friend. Find a good editor you can trust and who will spend real time and thought on your work. Try to make life as easy as possible for your editing friends. Number pages and double space.

After all this, send your work to the journal editors. Try not to think about the paper until the reviewers and editors come back with their own perspectives. When this happens, it's often useful to heed Rudyard Kipling's advice: "Trust yourself when all men doubt you, but make allowance for their doubting too." Change text where useful, and where not, politely explain why you're keeping your original formulation.

And don't rant to editors about the Oxford comma, the correct usage of 'significantly' or the choice of 'that' versus 'which'. Journals set their own rules for style and sections. You won't get exceptions.

Finally, try to write the best version of your paper: the one that you like. You can't please an anonymous reader, but you should be able to please yourself. Your paper — you hope — is for posterity. Remember how you first read the papers that inspired you while you enjoy the process of writing your own.

When you make your writing more lively and easier to understand, people will want to invest their time in reading your work. And whether we are junior scientists or world-famous novelists, that's what we all want, isn't it? ■

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COLUMN

Use poetry to share your science

Sam Illingworth explains how poetry can communicate and celebrate research.

In reading Vachel Lindsay's poem 'The Horrid Voice of Science' (Box), it is easy to see why many people perceive poetry and science to be at odds with one another: the former searches for beauty in the enigmatic and the magical, and the latter seeks to explain this mystery. As a scientist who uses poetry in my research, I feel that these two disciplines are complementary, and we should embrace poetry as a tool for communicating our research and developing new understandings of our fields.

One of poetry's most enduring qualities is its ability to consider a topic from a new point of view; see, for example, 'A Brief Reflection on Accuracy' by the Czech immunologist and poet Miroslav Holub. This makes poetry an effective medium for disseminating scientific concepts to non-specialists. Initiatives such as the Sciku Project (which presents scientific discoveries and ideas in a haiku format), the Universe in Verse (an annual poetic celebration of science) and my own blog the Poetry of Science (in which I write a weekly poem based on published research) introduce new scientific ideas in a digestible form that is free of the jargon and technical language that can turn non-specialists away from even the most lucid abstracts. These projects do not aim to fully explain detailed scientific results through laboured rhyme. Instead, they introduce the reader to new research, encourage them to find out more about a topic and help to make science more accessible to a wider audience.

These science-communication initiatives all demonstrate how poetry can be used to communicate science to non-scientists. But they are limited in the direction of their flow of knowledge. Here, scientists are writing poetry for non-scientists — and are not necessarily concerned with how such an audience could influence their research. Poetry is arguably even more effective in developing dialogues between scientists and the broader public; for example, the Experimental Words project, funded by Arts Council England, has brought together poets and scientists to create works of art that explore the spaces between the two disciplines.

These dialogues can present researchers with insights into the direction and governance of future research. This sort of approach has been used to discuss topical issues, such

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