

CAREERS

TURNING POINT Cancer researcher wins photography contest **p.131**

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advice to other scientists whose first language isn't English: "You just have to write the manuscript yourself. Lots of principal investigators will do the job for you, but that's not really good training." His persistence paid off: *Developmental Cell* published his manuscript.

When it comes to publishing in English-language journals, the philosophical differences between languages can be even trickier than the grammatical ones. Written English tends to be more direct and straightforward than Chinese, notes Cathy Wang, a retired forest-products professor based in Vancouver, Canada. She co-designed and teaches on the Scientific Writing in English for Chinese Authors distance-learning course at the National Pingtung University of Science and Technology in Taiwan. "In English, if you want to write well," she tells students, "you need to be clear, concise and forthright."

All English-as-a-second-language (ESL) scientists confront cultural differences, language barriers and grammatical peculiarities when trying to publish their work in international peer-reviewed journals written in English, which often hold the keys to successful scientific careers. Roughly written manuscripts might not even get sent out for review, so researchers must master not only writing in a foreign tongue, but also writing about technical, complex topics in a standardized way. (Several ESL scientists contacted for this story declined to comment, concerned that admitting to difficulties could have negative consequences for their careers.) And peer-reviewed publishing has its own 'culture' — rules about authorship, conflicts of interest and plagiarism that can differ from a scientist's own cultural norms.

PUBLISHING

Foreign tongues

Non-native English speakers face challenges when trying to publish. But there are resources that can provide help.

BY KENDALL POWELL

When drafting his first scientific paper in English, one Chinese third-year graduate student took the hard road. He insisted that his adviser, whose first language was English, allow him to write the paper himself. Although the student (who asked not to be named) had used

English textbooks at university in Beijing, and could read and understand English well, it was a monumental challenge to find the right words and craft sentences to express his scientific thinking.

"I went back and forth with my principal investigator maybe 20 times and it took four, five, maybe six weeks," recalls the researcher, now a biologist at a Colorado university. His

THE RIGHT WORDS IN THE RIGHT ORDER

When everything — from following journals' instructions for submission to answering peer-review criticisms — is difficult, the path to publication can be frustrating and time-consuming. English's dominance as the language of science puts non-native speakers at a disadvantage from the start, says Judith Hertog, an ESL specialist at Dartmouth College's Institute for Writing and Rhetoric in Hanover, New Hampshire. Journal editors may not explicitly reject papers because of poor English, notes Dugald McGlashan, publisher of Asian Academic Journals for Nature Publishing Group in Melbourne, Australia, citing his own experience. But, he says, poor language does create a barrier that scientists must overcome to ►

► get their papers accepted. “That’s a fine difference, but publishers cannot publish a paper that doesn’t make sense.”

There are strong pressures to publish in English. In some countries, universities offer cash rewards or other perks for getting papers into high-impact English-language journals, or even make it a requirement for career advancement (see *Nature* 463, 142–143; 2010).

Scientists who struggle do have options, from institutional support at university writing centres to services offered by private consultants and editing companies. Many research universities and government agencies now set aside funding specifically for language editing, to ensure that poorly written English does not impede publishing aspirations.

PROPER PREPARATION

Attention to language should start early, before the researcher begins to draft the paper, and continue until it is ready to be submitted (see ‘Correct, clear, concise’). First and foremost, researchers should read as many English-language papers in their field as they can, and pay careful attention to those that are easiest to read and understand.

“My most basic advice is to look for models of well-written papers,” says Hertog. She suggests that researchers keep a notebook for useful words and phrases, to help them to “master the language of their discipline”. Emulating an effective author is a great idea, she says, as long as no direct copying occurs.

Early-career scientists writing their first English-language papers could try enrolling



Biomedical editor Rashmi Nemade says scientists should learn how to write compellingly in English.

in a writing course, during which they might be able to construct and revise the paper from start to finish under an instructor’s guidance. Researchers should avoid relying too heavily on grammar-checking tools in word-processing programs, which aren’t designed for the nuances of scientific writing. And they should avoid translation software or online tools: the results can be barely readable, or even complete nonsense. If a scientist needs translation services, they should find a professional translator.

Another option is to use institutional writing resources. Many universities in the United States have writing centres that offer services specifically designed for international graduate students and postdocs. For example, Hertog gives free, private writing consultations and

holds weekly study meetings for ESL students.

She encourages ESL graduate students to begin writing about their research in English as early as possible. Advisers, she says, should assign research summaries, reviews of papers, poster presentations and other writing exercises in the first year of the graduate programme; even if they don’t, students should attempt such exercises for themselves.

Once a researcher has prepared the best version of a manuscript that they can, they should seek informal reviews from native English speakers. Morgan Tucker, a life-sciences and medical editor based in Boulder, Colorado, says that this step is imperative — even a few rough spots in the language and readability of a paper can prevent a journal editor from sending it out to reviewers. “There are too many unwritten rules in English. English speakers don’t really know the rules, but we can hear them,” he says. “There’s a cadence to the language that you have to hit to get the rhythm right.”

HIRED HELP

If there is only one English speaker in a lab or department, they can quickly be overwhelmed with requests to edit others’ work. Other editing options have sprung up in response to growing demand.

Some editing consultants specialize in particular fields of study. Such professionals can offer both English and scientific editing; that is, they can help to make the written arguments in a paper or a grant proposal as strong as possible. These services generally cost between US\$150 and \$450 per manuscript, depending on how much time the job takes. (Some authors choose to thank editors in the paper’s acknowledgements section, although there is no standard of practice.)

In addition to language editing, Tucker rewrites and reorganizes parts of papers, and highlights sections that do not make sense. He also formats the article according to the target journal’s guidelines, and compares it with a recently published paper. “I’ll make it look like it belongs in that journal to help clients get published,” he says.

Dan Csontos, founder of Elevate Scientific in Lund, Sweden, offers seminars, two-day workshops and editing services for ESL physicists and materials scientists. He also goes beyond language help, coaching authors on how to present their research logically and in the context of their field. He and his colleagues “can read any physics paper, understand the logical flow of ideas and see the gaps”, says Csontos, a former editor at *Nature Physics* and *Nature*.

Not all editors are specialized. Some publishers — including Nature Publishing Group — offer English-language editing services that cover a range of disciplines, and editing companies often offer a menu of translation, writing, editing and other publishing services.

WRITING TIPS

Correct, clear, concise

Similar glitches come up again and again for non-native English speakers writing scientific manuscripts in English. Here are a few ways to mitigate problems and frustrations.

● **Problem:** Basic language mistakes, including leaving out articles such as ‘a’ and ‘the’; confusion between words that sound the same when spoken, such as ‘site’ and ‘sight’ or ‘led’ and ‘lead’; and use of inappropriately informal language, such as ‘We interviewed 20 guys for our experiment’, or ‘This is a pretty accurate result’, in a paper.

Solution: Get a native English speaker to review the writing and provide feedback.

● **Problem:** The argument lacks a coherent or logical thread to take the reader from one point to the next.

Solution: Get a colleague from another field to read the paper and point out where it is confusing.

● **Problem:** Sentences are long and confusing, with subjects and verbs far apart.

Solution: Break up sentences whenever

possible: in general, they should be no more than 20 words long. Read through the text and reword to move subjects and verbs closer together where necessary.

● **Problem:** Transitions between sentences or paragraphs are abrupt or don’t flow well.

Solution: Establish the topic at the beginning of a sentence and provide new information at the end. Linking back to the previous sentence gives the reader ‘stepping stones’ of understanding. For example: ‘In India, the tiger population is making a comeback. This recovery is due to anti-poaching laws introduced in the 1990s. These laws also make it illegal to kill tigers for sport.’

● **Problem:** Using language that is too varied or elaborate, or that has a literary, rather than scientific, style.

Solution: Stick to one word or phrase for each concept — otherwise, the reader could get confused. The simplest language is usually the most readable. **K.P.**

Editage in Trevese, Pennsylvania, has websites in English, Japanese, German, Portuguese, Korean, simplified Chinese (for mainland China) and traditional Chinese (for Taiwan). The Japanese version has a free 'chat' function for scientists to ask general questions about publication and authorship practices; this function may soon be expanded to other languages. For a 4,000-word manuscript, Editage's basic language editing starts at around \$200; its premium service costs about \$400 and takes the paper from start to finish. Editors ensure that the article complies with the target journal's author guidelines and provide help with cover letters and responses to reviewer comments. They also provide coaching on issues such as journal selection, authorship, disclosure of conflicts of interest and peer-review function in Western journals.

Edanz, an editing firm headquartered in Hong Kong, caters mainly for scientists from Asia, the Middle East and South America. It offers comprehensive editing; a web-based journal-selection tool that can use a paper's abstract to draw up a list of the top ten most appropriate target journals from a pool of more than 10,000; a mock peer-review service; and in-person workshops on how to structure manuscripts.

"We teach authors how to be persuasive and construct stories that meet reader expectations," says Benjamin Shaw, China and global director of Edanz in Beijing. The company charges a flat fee based on the length and difficulty of the paper; articles below 4,000 words usually cost \$200–250. For that price, they do the work necessary — including multiple revisions — to bring it up to the level for publication in an international journal, says Tom da Costa, managing director for the firm's Japanese operations, based in Fukuoka.

Shaw notes that high-quality editing companies should be willing to answer questions about pricing, about who is doing the editing and about security and privacy. Edanz publishes its editors' profiles online so that scientists know who will be previewing their research.

Regardless of whether they seek help from colleagues, university services, private consultants or large firms, ESL scientists have to consider how to 'sell' their research to editors and reviewers, says Rashmi Nemade, founder of BioMedText, a biomedical writing and editing firm in Columbus, Ohio. "It's got to be entertaining and compelling," she says. "This concept is sometimes lost on scientists in general, but particularly those from other cultures where work is all about merit." ■

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TURNING POINT

Martin Oeggerli

Best known as a scientific photographer, Martin Oeggerli takes close-up images of microscopic creatures and structures that have been featured in scientific publications and art galleries worldwide. Although he is still a postdoc in cancer research at the University of Basel in Switzerland, his photography has become his passion and his main career track. Oeggerli received his third Best Scientific Image prize in March, in The EMBO Journal's annual cover contest, for capturing the most interesting microstructure.



A. TRAINA

How did you come to take up photography?

I drew a lot as a child — I especially liked snakes and lizards — and I always tried to draw as accurately and in as much detail as I could. When I started to study, however, I didn't have much time to draw, so in 2001, when I was 26, my father gave me my first camera, a digital Nikon Coolpix 995. In one month, I took 20,000 images of insects, snakes and lizards.

How did technology affect your photography?

That first camera had just 3.2 megapixels, but it had an outstanding macro function and excellent post-processing software. I looked at a close-up picture I had taken of a fly and thought it was spectacular. So I kept trying to get closer, and started to buy micro-adapters for the camera. Finally, I turned to scanning electron microscopy (SEM). These images are the best: there is huge depth of field, which is very appealing because it resembles the depth we see with our own vision. The tiniest things are magnified 500,000 times or more.

When did you first get public recognition?

In 2006, I entered an international photography contest in Germany and submitted an image of a pollen grain germinating, just at the point of releasing a pollen tube. The pollen grain hydrates as soon as it attaches to the female part of the flower, and can grow the tube in a couple of seconds. I had tried to distinguish the different structures and present them in a way that looked natural. I didn't expect an award, but I won third place in Best Research Image.

Has there been broad interest in your work?

Yes. I grew up in a small town and didn't go to many art galleries, but I was interested in books and magazines. I started to read *National Geographic* when I was 12 or 13. I always liked the pictures — it is regarded as one of the world's most important photographic magazines. So I couldn't believe it when *National Geographic* published my images in December 2009 as part

of a feature about pollen grains. I started scientific microscopy as a hobby and never expected it to go anywhere, but this was my international breakthrough. It confirmed to me that the work I do really is of interest.

What was your EMBO winning entry?

An image of a network of mosquito eggs. By trapping air, this mesh-like web repels water, allows the eggs to float and keeps the whole structure from sinking.

You tint your images. Why?

SEM is always black and white because it uses electrons instead of photons to view the specimen, and only light carries colour information. But black and white is not the truth, and I'm a perfectionist, so I try to mimic the natural colours. As a scientist, I think black and white hides some information, and as an artist, I want the image to be attractive. I try to highlight morphologically different structures to make them more visible so that the viewer can recognize complexity. I go to great lengths to reproduce the original colour.

How long does it take to create a final product?

It might take 20–60 hours — it depends on how much detail and how many structures are in the picture. It takes less time to create an image of a single pollen grain than of 5,000 spores of fungi, because I have to colour everything by hand.

Are you still active in research?

Yes. I have a year-long postdoctoral fellowship at the University of Basel, and I spend 20% of my time on cancer research. But my photography work frequently exposes me to samples and research from different areas of science — this year, for example, I produced an image from the dissection of a 1907 painting. ■

INTERVIEW BY KAREN KAPLAN