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Researchers who are not fluent in English often face hurdles beyond learning a new language.

## COMMUNICATION

# Science's language barrier

*Non-native speakers of English can face challenges that detract from their research.*

Science as a career attracts people from across the world. But whether researchers come from Beijing, Berlin or Buenos Aires, they have to express most of their ideas and findings in English. Having a dominant language can streamline the process of science, but it also creates extra barriers and the potential for conflict. In January, for example, a biostatistics professor at Duke University in Durham, North Carolina, chastised students from China for speaking in their native language on campus.

*Nature* asked seven researchers with personal or professional experience of language barriers to share their insights.

**YANGYANG CHENG**

## A complicated issue

*Physicist at Cornell University in Ithaca, New York.*

The incident at Duke University brought a lot of attention to a complicated issue. The professor who complained about Chinese students speaking in their native language was rightly called out on social media.

But, as someone who was born and raised in China, I have my own perspective on what happened. I've worked on many multinational collaborations, and I notice that European researchers often speak to each other in their native languages. However, it's relatively uncommon to see Chinese or South Korean scientists talking to each other in their own language in an academic setting away from their home country. They just don't feel comfortable.

I know that some professors in English-speaking countries become frustrated with students from China. Educational ►

► opportunities in China are extremely limited. Students' lack of ability to speak clearly in English is often perceived as a lack of ability to think clearly about science, and that is wrong.

I was fortunate to have begun learning English in primary school, and I excelled at a young age. In secondary school, people assumed that I would become a translator, a common career path for women in China. But I wanted to do science. I had no problem taking university entrance exams in English, but a lot of my colleagues — who are brilliant scientists — struggled with that process. They decided not to pursue a PhD outside China simply because of the language barrier.

Chinese researchers have made huge contributions to global science, but they've mostly done that using English. The Chinese language is rich and beautiful, but it still lacks much of the vocabulary that's needed to describe physical science. I don't even know how I would give a talk about my work in Chinese. It would take a lot of effort.

## SNEHA DHARWADKAR

### Have an open mind

*Wildlife biologist at the Centre for Wildlife Studies in Bengaluru, India.*

I find that scientists in India often look down on people who can't speak English. I work in the field of conservation. When scientists come here from Europe or North America to conduct field research, they have a strong preference for employing English speakers. They assume, correctly, that if they hire someone who isn't fluent in the language, they'll have to spend extra time training them. Most conservationists in India are short on time and funds, and they don't want to put in the extra effort. They end up hiring people from privileged backgrounds who have had the chance to learn English.

There are so many people out there who want to contribute to science, but can't because they don't know enough English. Funding agencies could help by including clauses to encourage visiting researchers to hire local residents, even if they aren't fluent in English. These locals understand the problem better than does a scientist who has never been to the area, and that knowledge matters whether it's expressed in Hindi or English.

I'm a member of @herpetALLogy, a Twitter group that brings together herpetologists of different backgrounds, languages and orientations. We have the space to talk about ourselves. The barriers can be hard to fathom for those who don't face them.

Science should reach local residents, and it should be beneficial to people beyond those who manage projects. When I hire

candidates, I try to understand what they're going through, as well as what they can contribute. We talk about their issues, and I learn a lot. Scientists need to be open to all people who show an inclination towards science.

## VERA SHERIDAN

### It takes a partnership

*Language and intercultural relations researcher at Dublin City University.*

I started out in life speaking another language. My family and I were refugees who fled Hungary during the revolution of 1956. I sympathize with students who are trying to learn English on top of everything else. I helped to compile a list of resources (see [go.nature.com/2wx54tc](http://go.nature.com/2wx54tc)) that are designed to introduce academic English to researchers from many parts of the world.

Many academics assume that students come to them fully formed, but every student has to learn the culture of their discipline. For those who don't speak English as a first language, the challenge is especially daunting. They can't do it alone. It requires a partnership with their mentor and their institution.

Mentors need to spend more time helping students to understand the conventions of scientific writing and the expectations of various journals. There's an art to turning a PhD thesis into a journal article. Without guidance, a student will just cobble something together that has no chance of being accepted.

Institutions need to do a lot more to support and prepare international students. It's not enough to hire a specialist in academic writing. Such specialists often have backgrounds in the humanities or social science. Students also need assistance from scientists who can help them to write for their specific disciplines.

I know of a case in which a researcher from India submitted a paper that came back to him largely because of language issues. He thought that he had addressed the problem but it was rejected again, not for the quality of the research but for the quality of the English. He rated the experience as one of the worst of his life.

I doubt that there was a huge amount to correct. It's not beyond the wit of the richest countries to make science more accessible. Language support and translation services could be built into grants.

English speakers have become the gatekeepers of science. By keeping those gates closed, we're missing out on a lot of perspectives and a lot of good research.

## CLARISSA RIOS ROJAS

### Reach out for mentoring

*Director of Ekpa'palek in Valkenboskwartier, the Netherlands.*

I'm from Peru and am a native speaker of Spanish. Being from abroad has some advantages. Laboratories are becoming more international, so it's helpful to be able to bond with people of different nationalities. It's easy for me to engage with scientists from Italy and Portugal because the languages of those countries are so similar to Spanish. It's a great reason to socialize.

In my experience, people who grow up speaking a language other than English are at a real competitive disadvantage when it comes to science. And it's not only because they will struggle to read and write scientific papers. Many haven't been exposed to the process and culture of science. Simply learning a new vocabulary won't be enough to help them to succeed. They need real mentorship, and they need it in their own language.

In 2015, I founded Ekpa'palek, a mentoring programme that helps students from Latin America to navigate academia. About 90% of the mentees speak Spanish, and 10% speak other languages. Learning English is still a priority. Almost all PhD applications are written in English, and most job interviews are conducted in English. I encourage students to use some of YouTube's many language tutorials. If they don't have access to the Internet, a common problem in Peru, I tell them to go to church. You can usually find native speakers of English, and they're typically happy to help someone practise.

## TATSUYA AMANO

### Embrace linguistic diversity

*Zoologist at the University of Queensland, Brisbane.*

As a native speaker of Japanese, I've struggled with language barriers. But science is struggling, too. Consider the field of conservation, in which much research is still conducted in the local language. In a 2016 study in *PLoS Biology*, my colleagues and I surveyed more than 75,000 biodiversity conservation papers that have been published in 2014 (T. Amano, J. P. González-Varo & W. J. Sutherland *PLoS Biol.* **29**, e2000933; 2016). We found that 36% were published in a language other than English, which makes that information much



less accessible to the wider world.

The dominance of English has created considerable bias in the scientific record. In a 2013 study in the *Proceedings of the Royal Society B*, we found that biodiversity databases were more complete in countries that had a relatively high proportion of English speakers (T. Amano & W. J. Sutherland *Proc. Biol. Sci.* **280**, 20122649; 2013). In other words, biodiversity records are comparatively scant in countries where English is rarely spoken. As a result, our knowledge of large parts of the world's biodiversity is much less robust than it could be.

We need to embrace linguistic diversity and to make a concerted effort to dig up scientific knowledge in languages other than English. That's been a major part of my research at the University of Queensland. I've been looking for studies across the world that assess conservation interventions. So far, I've identified more than 600 peer-reviewed articles written in languages other than English. I'm building collaborations with native speakers of those languages to get a better sense of the information in the papers and to see how they complement or fill in the gaps in English-based knowledge.

I suspect that a lot of native English speakers view language barriers as a minor problem. They probably think that Google Translate can solve everything. But the technology isn't there yet. You can't run a scientific paper through a translation programme and get a meaningful result.

We need to change our attitude to non-native English speakers. If you have the chance to evaluate a journal submission or a job application, think about the perspective that a non-native speaker can provide. And if you're a non-native speaker, you can bring a diversity of opinion and approach to the international community. You should be very proud.

## MONTSERRAT BOSCH GRAU Improve English-language education

*Director of in vitro studies at Sensorion in Montpellier, France.*

My PhD funding at the University of Girona in Spain included a 'mobility budget' to support international collaborative work. Thanks to that opportunity, between 2000 and 2002, I was able to spend a total of 12 months at a National Centre for Scientific Research (CNRS) lab in Montpellier. There, I had to learn two languages at the same time: English for work, and French for daily life. Not being able to communicate was frustrating. But I was also very alert and in a high-energy mode, because I had to move towards people:

they wouldn't come to me on their own because we didn't speak the same language.

I had been taught English in secondary school, but not to a high level, and in Spain we don't have English-language versions of television programmes. There was absolutely no English-language training available at my university. In France, there were courses to help foreign students learn French, but not English.

I tried to read a lot in English — not only scientific papers, but also literature. I was always looking for people to have informal conversations with in English. Because I was in France, most of my colleagues and friends were not from an English-speaking country, and we were learning English with each other. When we talked to a native speaker of English, we didn't understand anything, especially if they were from the United Kingdom — we all found the British accent difficult. And many English speakers didn't realize when they were speaking too fast. Some non-native English speakers would prefer to talk to other foreigners in English — it was easier.

A language is a tool for success. Mastering the way in which we speak and how we define concepts is an essential skill. We need a common language to communicate in science, and this is now English. That is a good thing, because English is perfect for science: it's precise and straightforward. A good level of English will help you to get the job or the project that you want, in both academia and industry.

The language barrier has never stopped me from doing what I wanted to do. But speaking at conferences, writing papers and asking for fellowships in English is harder and demands more energy when you're not a native speaker. You need to fight with the language.

At conferences, not speaking English perfectly is not a big problem: people will understand you. But there is a limit. Some people speak English poorly, and this can totally block communication. There is no subsequent scientific discussion, and we are missing the opportunity to share information and knowledge.

We need to improve English-language education before and during university. Having students do some research in another country, as I did, should be part of PhD programmes in every country.

Accept that sometimes you cannot be perfect when communicating in English, but do so anyway. Read books and watch television in English. Write all lab reports and conduct meetings in English. Ask your institute to offer English-language training. Ask your lab head to pay for a stay in a lab in another country during your PhD, or collaborate with other labs and move around. Travelling will improve your English, help you to understand other countries and ways of living, and open your mind.

## MICHAEL GORDIN

### A long and unfair history

*Professor of modern and contemporary history at Princeton University, New Jersey, and author of Scientific Babel (Univ. Chicago Press, 2015).*

There's nothing about English that makes it intrinsically better for science than any other language. Science could have gone just as far in Chinese or Swahili. But many economic and geopolitical forces made English the dominant language of research, for better or worse.

Having a single global language of science makes the whole endeavour more efficient. There are around 6,000 languages in the world, today. If science were being conducted in all of them, a lot of knowledge would be lost. In the 1700s and 1800s, scientists in Europe often had to learn French, German and Latin to keep up with their fields. We've gained a lot by lowering the burden to just one language. But there's also a lack of fairness. In countries where English isn't spoken, you shut out everyone but the well-educated. We could be losing some really smart minds.

Over the centuries, scientists worldwide have adapted to using English, but the language has also adapted to science. English has acquired a vocabulary for concepts and processes. When a new field emerges, its terminology piggybacks on the existing vocabulary. In computer science, English terms such as 'Internet', 'software' and 'cybernetics' are now used almost universally. A lot of languages don't have that history, so they don't have the infrastructure of scientific vocabulary. If the world decided that Thai or Hindi should be the language of science, we'd have a lot of work to do to create a whole extra terminology.

People often ask me whether another language will someday take the place of English. I doubt it. English is an anomaly. We've never before had a single global language, and I don't think that it will happen again. In the future — perhaps even in this century — science could split into three languages: English, Chinese and another language, such as Spanish, Portuguese or Arabic.

Even if every English-speaking scientist suddenly disappeared, English would still be the dominant language for a long time to come, because so much knowledge is already written in English. It's here to stay for a while. ■

INTERVIEWS BY CHRIS WOOLSTON AND JOANA OSÓRIO

These interviews have been edited for length and clarity.