NEUROSCIENCE A materials scientist tells of his brain-stimulation breakthrough **p.601**

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Researchers who choose to study or work abroad must adapt to customs, hierarchies and expectations that can differ greatly from those they are used to.

WORKING ABROAD

Globetrot for science

How to navigate cultural variances in a lab outside your native country.

BY ROBERTA KWOK

Punam Amratia grew up in Kenya, where she attended a British school. She then completed her bachelor's degree in statistics and a master's in epidemiology in the United Kingdom. In both nations, she was accustomed to people being blunt. If teachers didn't like her work, they were upfront about it. "They told me, 'It's crap. Go back and do it again,'" she says.

So when Amratia started her PhD in malaria epidemiology in 2014, she did not sugarcoat her own opinions. During her first month at the University of Florida in Gainesville, her laboratory met to discuss a paper that her supervisor was reviewing. Amratia recalls calling the paper "shit" and saying that it should not be published. A US lab mate described the paper's positive attributes and outlined items that could be improved. Amratia's colleagues suggested to her that she could be more diplomatic. After the meeting, she tried to temper her directness.

But Amratia also faced problems socializing with her PhD-committee members, partly because she didn't understand US popular-culture references. At a social event, while her colleagues laughed about a popular 1980s TV show, she stayed quiet because she was unfamiliar with it. Such incidents made it hard for her to establish a casual rapport with these faculty members, so she did not feel comfortable asking them for advice during her doctoral programme.

Plenty of opportunities exist to study and work abroad. But some early-career scientists might face challenges adapting to different communication styles and different workplace and academic hierarchies. Supervisors and junior researchers can reduce the risk of misunderstandings by actively learning about each other's cultures and communicating workplace expectations clearly.

It is important both to be sensitive to cultural differences and to avoid inadvertently stereotyping. Nanda Dimitrov, director of Western University's Teaching Support Centre in London, Canada, who has written about cross-cultural graduate supervision, says that it's important not to make assumptions about students solely on the basis of their culture. A wealthy Chinese student from Hong Kong, for example, could see things differently from one who comes from a rural area on the mainland, she notes. And individual perceptions ▶

can vary: Amratia says that she personally encountered directness more often in the United Kingdom than in the United States, but others might not have experienced this. Dimitrov points out that the relationship between junior researcher and supervisor is influenced by many factors including personality, previous experiences and the department's and discipline's workplace culture.

Moving abroad to study or work has become more common, partly owing to encouragement from national governments and funding agencies. The number of students pursuing higher education abroad rose from 1.7 million in 1995 to 4.1 million in 2013, according to the *UNESCO Science Report: Towards 2030* (see go.nature.com/2wfvwyq), published in 2015 by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in Paris. European funders promote the practice through programmes such as the Marie Skłodowska-Curie actions, which provide grants for researchers studying or working outside their home countries. From 2003 to 2010, the Chinese government increased the number of scholarships for studies outside China from fewer than 3,000 to more than 13,000. According to the UNESCO report, the regions with the highest proportions of students seeking higher education elsewhere are central Asia, Arab states, sub-Saharan Africa and Western Europe. The most popular destination for all outbound PhD students is the United States, where about half of international science and engineering PhD students are enrolled, followed by the United Kingdom, France and Australia.

Many labs experience few problems with cultural differences. "Science workplaces are so international," says Kaisa Kajala, a Finnish plant biologist at Utrecht University in the Netherlands who has studied or worked in the United Kingdom, Australia and the United States. "People are pretty understanding of different cultures."

When misreadings do arise, however, it's important to address them, because the stakes are often high for international students. If research takes longer than expected, they might have difficulty extending visas or paying tuition fees. Principal investigators (PIs) who make invalid assumptions about a student's intentions might write tepid letters of recommendation for job applications or decide not to collaborate with that person after graduation.

Expectations for behaviour in areas such as leadership, communication and feedback style can vary across cultures. "While it is important never to stereotype, if we don't try and understand how cultures differ, we are missing a huge part of what shapes how people act and how misunderstandings can arise," says Andrew Spencer, director of Rose Window Consulting near Oxford, UK, who has run training programmes for international businesses (including Springer Nature) on managing and communicating across cultural boundaries. For instance, he says, in the Netherlands, negative feedback tends to be given clearly and unambiguously, whereas in Japan, criticism might be more indirect. Spencer recommends *The Culture Map: Breaking Through the Invisible Boundaries of Global Business* by Erin Meyer (PublicAffairs, 2014) for more examples.

One point of difference that can arise is the appropriate level of deference to supervisors. Dimitrov says that some Nigerian, Egyptian and Chinese international students report that in their home nations, a large power differential between students and teachers is common, and that students generally follow instructions without arguing. But a supervisor from a country where debate is expected might sometimes incorrectly interpret a lack of questioning from the student as a lack of interest in the work, says Theresa Winchester-Seeto, an independent consultant on higher education in Sydney, Australia.

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Keshun Zhang faced this issue after moving from China to the University of Konstanz in Germany to pursue his PhD in psychology. He was used to following teachers' suggestions. But "the culture in Germany always encourages you to argue, to fight for yourself", says Zhang, now a postdoc at the university and co-author of the 2016 book *When a Chinese PhD Student Meets a German Supervisor: Tips for PhD Beginners* (University of Konstanz). With his supervisor's encouragement, he started pushing back — for instance, if he thought data should be analysed using a different statistical method, he would say so. After his first year, his supervisor said, "'Wow, in this one year, finally you have learnt to say no,'" Zhang recalls.

Zhang also realized that he was expected to work more independently than he had during his master's programme in China. In Germany, he peppered a postdoc with frequent questions about issues such as statistical methods. His supervisor urged him to try to solve problems on his own and to seek guidance only if he became stuck. Zhang initially found this approach difficult but came to prefer it.

The absence of a strictly defined hierarchy can encourage freer communication, says Salim Reza, a radiation-detector scientist at Mid Sweden University in Sundsvall. When he moved from his native Bangladesh to Sweden for graduate studies, he learnt that he did not need to address faculty members as 'sir' or 'professor', or remain standing in their offices. This informality made it easier for him to approach professors to clarify a topic or to propose a new research angle. "I could go with the craziest idea to my teacher, and he would explain why it was good or bad," he says.

Supervisors also can clarify expectations for the student's responsibilities when they arrive. The *Western Guide to Graduate Supervision* (University of Western Ontario Teaching Support Centre, 2008) includes a rating scale that asks questions such as whether the student or supervisor will select the research topic and decide on methods. A student and PI could fill out the form together, discuss their answers and resolve discrepancies, Dimitrov says.

Davor Solter, a mammalian-developmental biologist from Croatia who now splits his time between New Mexico and Maine, says that he never encountered problems owing to cultural differences as a PI in the United States, Germany and Singapore. His lab members' countries of origin were irrelevant to their performance, he says.

MIXED MESSAGES

Sometimes, though, misunderstandings can stem from differences in communication style. In some countries, the 'feedback sandwich' is common, Dimitrov says: start with praise, suggest improvements and end with encouragement. Students from countries where this format is less common might think that because comments were mostly positive, the suggestions are optional and can be ignored, she says. To avoid such mishaps, students could write an e-mail after each meeting summarizing the feedback and next steps so that the supervisor can correct their interpretation if needed.

Conversely, a student who is accustomed to gentler feedback might be 'traumatized' by cultural tendencies in other countries, such as Germany or the Netherlands, to give more direct criticism, Dimitrov says. Senior researchers could smooth over differences by discussing how the student prefers to receive comments, she suggests. Students could also talk to lab mates about the feedback; hearing others' stories of critiques — and positive outcomes, such as getting a paper accepted — could help them to overcome discouragement.

Some researchers are surprised by their host country's e-mail practices. Laetitia Wilkins, a postdoc in evolutionary biology

HERO IMAGES/GETTY

Communication styles can vary across cultures.

at the University of California, Berkeley, says that in her native Switzerland, people typically reply to nearly every work-related message. "It's almost mandatory that you answer," she says. In California, she found a more relaxed approach. When she e-mailed another researcher to request a data set and heard nothing, she wondered if she had done something wrong and the person did not want to collaborate. She did not send a follow-up message because, she says, that would be considered rude in Switzerland. Eventually she realized that ignoring or 'losing' e-mails was common in the United States. Now, if a message goes unanswered, she sends another e-mail a few days later and usually gets a friendly response.

Other scientists find that the priorities attached to socializing differ from what they are used to. In Reza's experience, people in Bangladesh do not usually take coffee breaks at work. But in Sweden, he realized that it was important to attend *fika*, coffee breaks that the department usually took each day. "We are obsessed with *fika*," he says. The gatherings provide opportunities to make social plans, hear what other groups are doing and discuss research issues.

Some scientists welcome the change of pace offered by a fresh environment. Ecologist Christine Lucas moved from the United States to Uruguay for a postdoc position and is now a faculty member at the University of the Republic in Paysandú. She found that her new colleagues tended to keep a better work–life balance. When she became pregnant, she easily postponed the start of her postdoc by a few months; once she began, she had flexible hours, could sometimes work from home and designed a project that required little fieldwork. Friends who did postdocs in the United States seemed, to her, under more pressure to work with lab members face-to-face and to meet tough publication targets. And, she adds, it is acceptable for her department meetings in Uruguay to start 5–10 minutes late — allowing for unexpected obstacles such as transport strikes.

Whether they are welcoming international students or starting work in new countries, scientists can ease the transition by remaining non-judgemental. People sometimes brush off a student from another country as 'rude', but "in their culture, they're not", Amratia says. Researchers should also remember that their nation's customs aren't necessarily best. Solter says that his Croatian background helped him here: "When you come from a small country, you don't assume everybody should be doing things your way," he says. "I never cared if somebody was different than me as long as it didn't seriously affect the rest of the lab." ■

JEAN LACHAT/UNIVERSITY OF CHICAGO

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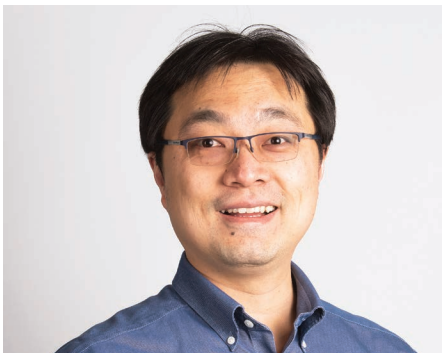
BACK STORY
Brain stimulator

Materials scientist Bozhi Tian developed silicon-nanowire solar cells in 2007. Now, at the University of Chicago in Illinois, he has shown how similar nanoscale devices can be used to manipulate brain signals with light.



Describe what your team's latest study has achieved.
We've shown that we can stimulate behaviour in a mouse by placing a nanoscale silicon mesh on the part of the brain that translates nerve impulses into movement, and then shining a light onto the mesh (Y. Jiang *et al. Nature Biomed. Eng.* https://doi.org/10.1038/s41551-018-0230-1; 2018). For example, we were able to control the animal's left forelimb by flashing a beam at the right side of its brain.

Why is this approach game-changing?
Until now, there have been only two main methods of neurostimulation. The first involves implanting electrodes to produce neural activity. The second, called optogenetics, requires cells to be genetically modified so that they can be controlled using light, but genetic modification is difficult and carries ethical concerns. Our approach uses a non-genetic neurostimulation device that enables distant nerves to be stimulated with light. It could have a big impact on the treatment of pain and other disorders.

Has it led your research in a new direction?
Yes, we now plan to do research on non-human primates — for example, exploring how to restore grasping functions after paralysis.

Does the device have potential clinical applications?
If we put the silicon mesh on the brain surface, we can elicit some activity deep inside the brain. And if you can stimulate the brain, you can treat certain neurological diseases or help a person to regain control over parts of their body. So it could be used to treat diseases such as Parkinson's or disorders such as depression.

Describe one of your breakthrough moments.
My graduate student Ramya Parameswaran has demonstrated how a silicon nanowire can stimulate single cells (R. Parameswaran *et al. Nature Nanotech* **13**, 260–266; 2018). Some of the gold that catalyses growth of the silicon wire becomes individual atoms that cover the wire's surface. When we removed the atomic gold, some neurons couldn't be activated. We later found that the gold enhanced the silicon's electrochemical properties and made it a better neurostimulator.

You switched your research focus from energy to neurostimulation. What happened?
I left China to start a PhD at Harvard University in Cambridge, Massachusetts, in 2004, working on the use of single nanowires in photovoltaics. We showed that silicon nanowires can convert sunlight into electricity, just as conventional solar cells do. However, they are also small enough to be integrated into nanodevices. After that work was published (B. Tian *et al. Nature* **449**, 885–889; 2007), I decided to completely change my research interest from energy to electrophysiology and bioscience.

Why did you make that change?
Biology offered lots of opportunity and room for exploration, especially in bringing nanowires and neuroscience together. And I like to explore the unknown. So, for the second half of my PhD, I worked on developing a transistor that's small enough to be delivered into a single cell to record electrical activities.

How was the transition?
It was tough. I had no experience in cell culture, electrophysiology or working with animal tissues. I took a neuroscience course and learnt tremendously from that. Even so, there were setbacks. For example, my cell cultures kept getting contaminated. But I told myself that good moments would come if I persisted.

How did you find collaborators?
When I began at Chicago, some biologists were interested in collaborating; others weren't. I gave a lecture to biophysics students, and Ana Correa, a biochemist and the wife of molecular biologist Francisco Bezanilla, attended. She introduced me to her husband afterwards, and he and I have since written grants and papers together. Sometimes you just need that right moment and right person. ■

INTERVIEW BY VIRGINIA GEWIN

This interview has been edited for clarity and length.