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Teaming with bright ideas

Four researchers share their tips for building and maintaining international collaborations.

The number of international research collaborations continues to rise, and for good reason: it's easier than ever to connect with overseas colleagues, and doing so can be an effective way to share and advance knowledge. *Nature* spoke to four scientists who routinely participate in such teamings and who have studied how to create and look after them.

KATHRIN ZIPPEL Be inclusive

Sociologist, Northeastern University, Boston, Massachusetts.

In our analysis of a 2006 US National Science Foundation survey of PhD holders in academic positions, we found that one-third of men reported taking part in an international collaboration, compared with only one-quarter of women (L. M. Frehill and K. Zippel *J. Wash.*

Acad. Sci. 97, 49–69; 2011) Women also publish less often with international colleagues than men do, according to a study that analysed research performance in 12 regions and 27 disciplines, over 20 years. Data from European studies show that women's international mobility starts to fall when they reach the postdoc level.

My recent book (K. Zippel *Women in Global Science: Advancing Academic Careers Through International Collaboration*; 2017) drew on interviews carried out between 2007 and 2015 with more than 100 women, many of whom were being held back by gender-specific 'glass fences' — organizational and structural barriers that control access to resources and opportunities.

It comes down to money and time. I found that funding is a major obstacle for women — whether for attending conferences to find collaborators or for travelling to establish collaborations. Women are often still the primary carers in their families, so travel comes with an

extra financial burden in the form of care costs for children or other family members.

Women shouldn't hesitate to ask for what they need to scale a glass fence. For example, one woman I interviewed, who had four children, requested help to cover child care whenever she received an invitation to speak or work abroad. She went only if it was provided. Women can also turn to international funders, but those vary in terms of how they acknowledge caring responsibilities.

Women also tend to be in teaching roles, rather than in research-intensive ones, and are overburdened with service obligations, such as serving on faculty recruitment committees or organizing lecture series. This means they have less time for research collaborations.

And unless international collaboration yields results that are valued at an institution, it will be invisible. Some institutions view international collaborations as a frivolous pursuit that's likely to count less towards tenure than are other endeavours. Everyone should ►

► check to what degree global engagement might or might not factor into promotions. Still, women should think of international research collaborations as a way of expanding their academic circles and doing the kind of internationally recognized science that gets published in high-profile journals — and that will help to secure tenure.

Women who mainly teach should seek institutional funding so that they can travel abroad with students to conduct research. They can identify potential international collaborators by searching through journals, associations and government and organizational reports to find people who do similar research. It's also a good idea to talk to international colleagues on campus or at neighbouring institutions about their research plans, in case there are overlapping or complementary interests.

I also encourage men to be allies, to make sure that women get invited to conferences and to ensure a safe, respectful environment at such events. If we wait for women alone to change the world, we'll be waiting a long time.

RICHARD DE GRIJS Identify potential pitfalls

Astrophysicist and associate dean for global engagement at Macquarie University, Sydney, Australia.

At any given time, I am involved in five to ten collaborations. Some might have only one or two people. Most astronomy research, including mine, is driven by small collaborations. It's important that members of a team get on, otherwise the team will go nowhere. Often, I'll meet someone at a conference and we'll end up working together. Alternatively, I'll need someone else's expertise, or they'll need mine.

Multinational collaborations, which often require government investment, come about in different ways. But as long as the collaborators respect each other scientifically, things should be fine. As I wrote in 'Ten simple rules for establishing international research collaborations' (*R. de Grijns PLoS Comput. Biol.* **11**, e1004311; 2015), you want collaborators who are dependable, reliably meet deadlines and have a good reputation. Working with such people is the best way to protect your own reputation.

I belong to a collaboration of 20–30 members who are part of an observational campaign at the European Southern Observatory in Chile. I was invited to join by a personal contact. The team has been in place for around 9 years and has published more than 30 papers.

It's essential that all the members of a team meet in person, ideally at least once every two or so years — otherwise, connections are watered down and the team becomes less effective.

Meetings can also help to address any cultural differences. I'm a Dutch scientist who has collaborated extensively in the United States, the United Kingdom and China. Students in some nations might look up to you and treat you as the person who knows everything, whereas in other nations, researchers are used to being questioned. And deadlines, particularly if not strict, can be taken more loosely in some cultures than in others. In larger collaborations, and in fields such as astrophysics, which have proprietary information, it can help to have a formal agreement about what's expected of the team and how data will be used.

JOSÉ ANTONIO CASTILLO MORALES Reach out

Biologist, Yachay Tech University, Urcuquí, Ecuador.

About 80% of publications in Ecuador result from international collaboration. For small Central and South American countries such as Ecuador and Paraguay, international collaboration is extremely important.

Few native Ecuadorean scientists have doctorates and do research, but the number of people with PhDs is rising as the national government invests in sending young people abroad for their degrees. I work at Yachay Tech University, which opened in 2014. Roughly 80% of the faculty members there are from other countries. We are funding fellowship programmes to train more PhD students in hard sciences. We require students to learn English, in part because that is the language of science publications. Students are wise to build solid collaborations with their advisers overseas, and to keep those going when they return. Ecuador has cultivated strong ties with programmes in Belgium, Spain and the United States.

That said, most of our international collaborations begin because a foreign partner is seeking one, particularly in areas related to biodiversity, agriculture and medicine. Ecuador is rich in plants and animals, and continues to do research on Zika, malaria and dengue.

Researchers at Ecuador's big universities, particularly English speakers, are the most likely to be interested in joining a collaboration. But, because many Ecuadoreans do not speak English, it might be best to send them a message in Spanish, for example using Google Translate, to increase your chances of a response.

By law, students who have fellowships or studentships funded by the national government are required to come back to Ecuador, either to teach or to help the country in some other way using their knowledge. The government is trying to open posts in universities and companies to attract these newly qualified master's and PhD holders.

LEIF OLTEDAL Formalize agreements

Neuroscientist, Global ECT–MRI Research Collaboration, University of Bergen, Norway.

In 2013, while using magnetic resonance imaging (MRI) to study neurological responses to electroconvulsive therapy (ECT) as a treatment for depression, I realized I was often being scooped by other groups doing the same thing. Our research group in Bergen established a collaboration with Anders Dale, a neuroscientist at the University of California, San Diego. Next, I searched PubMed to identify all the other groups that were using radiology before and after ECT. Anders agreed that we should invite other groups to join a collaboration to analyse data longitudinally.

In 2014, I contacted 12 groups, asking them to collaborate. Together, we could analyse data from 150–200 patients instead of the more typical 10–20. Twenty minutes after I sent the first e-mail, I got a reply from one group saying that it was a great idea. More people answered over the next few days. We were able to invite everyone — 13 international participants from 10 sites — to Bergen for a 2-day meeting in June 2015. I was surprised by the number of groups that expressed interest. Our collaboration with Anders was crucial to the response. I'm not sure that we would have got such numbers had the invitation come just from me, then a postdoc in radiology.

Before our collaboration's first meeting in 2015, we had four group conversations in which people introduced themselves and spoke about the research projects they were working on. We established a pact for the collaboration that included rules on authorship and our data-sharing agreement. We have not had direct conflicts, but we have discussed how to manage potential conflicts should they arise.

For example, we created a shared repository for project data on a common server. Any collaborator who has contributed data can suggest what kinds of analyses he or she wants to do. If the team agrees, the person can go ahead and do the analyses. We decided that collaborators retain the right to their own data. Therefore, if one of us wants to do an analysis, anyone who doesn't think it's a good idea can request that their data not be included. We have been able to resolve any issues arising when two groups want to do the same analysis — for example, we discuss whether the groups can collaborate, or do different analyses sequentially. ■

INTERVIEWS BY VIRGINIA GEWIN

interviews have been edited for length and clarity.