

## LETTERS

Edited by Jennifer Sills



## Global collaboration

In your experience, what is the biggest challenge to global scientific collaboration? How should it be addressed? In July, we asked young scientists to tell us their thoughts.

### NEXTGEN VOICES

A sample of their responses can be found below. To allow for as many voices as possible, in some cases we have printed excerpts of longer submissions (indicated by ellipses) and lightly copyedited original text for clarity. To read the complete versions, as well as many more, go to <http://scim.ag/NG12Results>. Follow *Science's* NextGen VOICES survey on Twitter with the hashtag #NextGenSci.



...IN MANY CASES, scientific research and the consumer market that can potentially benefit the most are separated by cultural and political boundaries.... From my experience in the medical device industry, collaboration is hindered by researchers' inability to distinguish between the various attitudes toward death in indigenous versus modernized cultures. It is important for me as a scientist to understand which parts of the world have greater demand for the most technologically advanced life-saver. Greater cultural

competency must be engrained in scientists' brains from a young age, and it is best learned through experience, not from a textbook. Thus, I propose that the scientific community reevaluates its outlook on study abroad programs to encourage aspiring scientists to learn overseas....When young researchers make breakthroughs in their respective fields, they should be able to quickly identify which parts of the world they should collaborate with so that they can help the people who need their innovation the most.

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SINCE 2011, I'VE been regularly involved in global mental health collaborations between India and the United States. I initiated these because I am originally from India and moved to the United States for graduate school....A big challenge I have faced is allowing my Indian research collaborators to have increased interaction with my team in the United States. I go to India once a year to transfer my knowledge and train collaborators, but it would really be great to have more mechanisms that allow my collaborators and mentees to visit me in the United States often, perhaps for internships of 3 to 12 months, to learn firsthand from our methods and then go back and apply these in their local setting. If such travel and interaction were built into global science collaborative grants, and more such grants were available, they would be bound to stimulate greater global collaboration....

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THE OLDEST AND still the biggest barriers to global scientific collaboration are religious and cultural differences....The problem can be addressed only by removing the borders

between countries. People should be able to travel all around the world freely (without applying for a visa), know new cultures, share food, and share how to create value for humanity. This process will surely take a long time and involve many security and public issues. However,...if we want to discover new planets, first we need to learn to live together in the world.

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I BELIEVE THAT the current system, in which research is mostly funded and organized at the national level,...is the greatest barrier to global scientific collaboration. We need a global research system,

in which every country, developed or developing, must contribute to a central fund that seeks to establish research infrastructure across the globe....The United Nations was established to take care of global security; the same should be done for scientific research....

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...BUILDING TRUST between researchers in different parts of the world and sustaining it throughout the project is undoubtedly the biggest challenge facing global collaboration....After practicing research in

Egypt and the United States, I can say that different countries manage collaboration differently due to many factors, including cultural variations and differences in working environment. These differences might lead to misunderstanding between collaborators, a gap in connection, and consequently an easy loss of trust, which results in problems that hinder progress and allow more problems to develop. Scientists worldwide should set rules and

ethics for effective collaboration; a global norm would provide a common ground for scientists to build together the trust required for the project to succeed. I also suggest having a course in each graduate school for young scientists...to learn these rules and ethics and get the chance to apply them early in their careers.

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...THE BIGGEST challenge to global scientific collaboration is the lack of funding earmarked for the costs of collaboration itself....Funding the exchange of knowledge itself—and not a tangible thing like

a piece of equipment or a stipend for a worker—does not seem to be on the radar of most funding agencies. Worse, there is an unrealistic expectation that expertise—like data—could or should somehow be exchanged online rather than in person....Despite the tantalizing idea of scientific work crossing borders freely (as business does), we lack the funding infrastructure to maintain large-scale scientific collaboration on a global level.

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THE BIGGEST challenge that global scientific collaboration faces is dealing with technical secrets and issues of national security. I know of one collaboration that was forced to terminate

midstream because the results could have, potentially, been used for military purposes, and this was considered a “security threat” to one of the countries involved. To make the case even worse, the foreign researcher was investigated and faced the risk of being deported from the primary country of the collaboration. Such collaborative work is not only a waste of money and time, but could be disastrous for the researcher’s career and personal life. Therefore, I believe that before embarking on such research endeavors, all parties should understand the areas where collaboration is permitted and which lines should not be touched or crossed....It

would be very helpful if governments provided researchers with directions so they could avoid risky areas and thus protect themselves....

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THE BIGGEST challenge to global scientific collaboration is the language barrier....In my 6 years of struggling to learn French, I often found that Google Translate’s abilities were improving faster than

mine. Unfortunately, automated translation of technical terms and scientific papers lags by comparison. We should assemble a network of bilingual scientists to collaborate with Google; together, they will produce scientific software on par with Google Translate....

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REGULATORY mandates are a major obstacle to global scientific collaboration. Research that is deemed permissible in one country may be illegal in another country....This barrier has been highly

visible in the field of human embryonic stem cell research, where researchers in the United States must adhere to legislation and funding limitations that researchers in European countries have not faced. There are many reasons why regulations developed by individual countries are appropriate to govern the research occurring in that nation, but disparate regulations are a major obstacle for worldwide collaboration in the scientific community.

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...IT WOULD BE wonderful to have free international scientific websites for every subject, where all groups could share their manuscripts, thesis papers, books, and opinions related to a

specific research topic. This would enable us to interact easily because, although international meetings are important, not everybody has the opportunity to attend them and they don't usually last for more than a week. Therefore, by creating networks, it would be possible to share information and ideas among scientific communities....

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THERE EXISTS a wide gap in the technological advancement among developed, developing, and undeveloped countries. To address any global problem, collaboration among all these countries is a

must. However, the divide that exists in technologies, working culture, requirements, and vested interests of the participating countries will hinder implementation of any global project....To tackle such problems, time and funding for preparation of common facilities at each collaborating unit should be provided before the project starts. Identification and recruitment of equally competent collaborating members should be handled seriously. Strict monitoring of project implementation progress should not be just limited on papers, but be physically verified at each location.

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...THE IMMIGRATION cap in many countries... and the issues associated with international mobility of research funds...affect science and research.

To enable scientists to tap into the global scientific networks and collaborations, it would be beneficial if universities and research centers were separated from any immigration cap. International mobility of R&D funds, if made more transparent and less bureaucratic, would also help the mobility of scientists and science, in general. Given the scale of issues that science tackles, governments should put more emphasis on facilitating technology

**SUBMIT NOW: MISSING CLASSES**

Add your voice to *Science!* Our new NextGen VOICES survey is now open:

**What was missing from your science education? Name and describe a course that would have better prepared you for your science career.**

Your course can be as serious ("Preventing Plagiarism 239") or as quirky ("Handwriting for Physicians 101") as you choose.

To submit, go to [http://scim.ag/NG\\_13](http://scim.ag/NG_13)

Deadline for submissions is 14 November. A selection of the best responses will be published in the 2 January 2015 issue of *Science*. Submissions should be 100 words or less. Anonymous submissions will not be considered.

transfer to encourage global scientific collaborations.

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IN MY OWN experience, diplomatic issues have lately put way too many obstacles before global scientific collaboration....I was born in Brazil, and I currently live in Israel. Israel could share

technology with Brazil in, at least, fields like surveillance and riot control, drought avoidance and water reservoirs management, and border control. Meanwhile, Brazil has a vast experience in exploring oil and gas in deep waters, a field that Israel is starting to work on. But relations between them were stressed due to diplomatic issues concerning the current military operation....

There should be scientific cooperation councils in every government whose main activity would be creating the proper conditions for a scientific collaboration even if the countries involved don't keep good (or any) diplomatic relations.

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FEAR IS THE cause of separation. PIs and Ph.D.s alike are most afraid of being scooped. That is why we are hiding locally and theme-wise in our scientific niche....

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THE BIGGEST challenge to global scientific collaboration is that funding dictates what should be the subject of research instead of identified problems motivating scientific objectives. In

most cases, when you bring together scientists from the developed world (mostly carrying the funding purse) and those from the developing world (existing with specific challenges), there is no proper challenge-mapping in identifying important research areas that have shared relevance. Often, researchers from developed countries brush aside input from scientists from the developing countries....What is needed are equal partnerships....

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THOUSANDS OF Fellows, most of whom are young investigators, visit or study in different countries under sponsorship by Chinese government scholarships each year. The biggest challenge in global

scientific collaboration for most of them is lack of ideas and innovations. Their supervisors or overseas collaborators are actually serving as idea/theory providers, while many of these investigators are learning new methods and designing the experiments to verify others' ideas and theories. There is an interesting saying that the laowai (foreign scientists) dig holes, but Chinese investigators fill them with papers,...

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