ELEPHANT
IN THE LAB

OPINION

Translating Science to our global communities

Short title	Translating Science to our global communities.
Long title	Transforming knowledge to help others in a global setting.
Authors	Jyoti Mishra [1]
Author affiliation	[1] Neural Engineering & Translation Labs (NEATLabs), University of California San Diego, California, USA
Author bios	Dr. Jyoti Mishra is an Assistant Professor in the department of Psychiatry at UC San Diego. She founded the Neural Engineering and Translational Labs (neatlabs.ucsd.edu) and directs its human research. She is trained in the cognitive and computational neurosciences and further, translates this understanding towards improving mental health diagnostics and therapeutics in both local and global communities.
Date published	1st April 2019
DOI	10.5281/zenodo.2619955
Cite as (APA)	Mishra, J. (2019). Transforming knowledge to help others in a global setting. *Elephant in the Lab*. DOI: https://doi.org/10.5281/zenodo.2619955

'Hello, I am here to help!'

For several afternoons as an undergraduate student in New Delhi, I would take a bus to a bustling market and settle into a small office for the Childline counseling service. I was trained as a volunteer responder and counselor for children in distress. All afternoon, the phone would ring. It would usually be a child suffering from exam stress or anxiety and a few tips would go a long way. Occasionally a child would report being in danger, and we followed a protocoled plan-of-action to speedily ensure they are brought to safety. That was in 1999, and each incident left me wondering what I could do more.

Twenty years later, I am recounting this at my university lab in the United States. I came to this country several years ago to study human neuroscience, to understand how our brains help us interpret the world around us, and in turn how the world around us influences our brains. Along

the way, while studying the basic sciences, I got impatient. My experiences had trained me to say, 'Hello! I am here to help!'

So how would I transform my new found knowledge to help others?

A few years into my scientific training, I discovered my answers in the pursuit of the translational sciences. Translation is the bridge between bench to bedside science. It is the exciting intersection at which we can improve the state-of-the-art for clinical sciences by using new discoveries in the basic sciences. There are several steps in the translational pathway – testing new assays, drugs, technologies and interventions in animal models, testing in humans, testing for safety and feasibility, then testing against placebo controls, testing against standard-of-care, testing in large sample data, all to convincingly demonstrate efficacy. Once efficacy is established in translational research, implementation science kicks in to integrate a new method or practice within real-world care to systematically determine its effectiveness.

Each step of science is challenging. The systematic progress from basic science to translation to implementation can take several years. Yet, it is important to consider that advances in each domain can be accelerated if they are not carried out in silos. For instance, a translational study may make it evident that a new basic approach has low feasibility in the clinical setting, and so the scientist must go back to the drawing board in pursuit of a new basic invention. As the basic scientist or engineer develops a new approach, s/he would benefit from keeping open communication with the clinical researcher. It is the notion that innovators working alone are very good at creating inventions that no one needs! Instead, scientists should be innovators who solve real-world problems, constantly recalling 'I am here to help!'

What does all this have to do with global science?

Global science is where the boundaries of basic, translational and implementation science blur the most. In global science, researchers collaborate across continents to generate new basic and applied scientific understanding for global citizens. While most science must build upon science that came prior to it, many-a-times global scientists have to solve problems at entirely new frontiers. For instance, human studies in the western world are predominantly WEIRD, that is, the study subject populations are primarily people from Western, educated, industrialized, rich and democratic societies (Henrich et al., Behavorial & Brain Sciences 2010). Humans in these studies only represent 12 percent of the world's population distribution, are not only unrepresentative of humans as a species, but on many measures they may be outliers. Hence, the assumptions of prior basic science must be re-confirmed within a new global setting.

With regards to translation, a new method/approach may not be feasible in the global setting not only because it is being tested within a new human cultural context, but also because it may not be cost-effective. For instance, a single brain scan using magnetic resonance imaging (MRI) can cost hundreds of dollars; using this method in a large scale brain study in a low-income country setting is not feasible. Yet, there are other brain monitoring methods such as EEG (electroencephalography) that is one-thousandth the cost of an MRI scanner. EEG technology

may have utility, as well as potential for scalability, in the global setting for brain assessments and therapies. Some of my own research investigates this, and I have learned that we need to make hand-in-hand research advances at both the basic and translational level. For instance, we need basic advances in engineering algorithms for processing EEG-derived brain data in real-world settings, as well as translational applications for use in the context of real-world problems faced by global humans.

Global science is also local

At this point, it is important to emphasize that global science also applies to our local communities. By this, we understand that globalizing science does not just mean unifying scientific inquiry across the far corners of the world. In any case that is hard to accomplish without a strong network of motivated collaborators. Yet, within our own country, we find several pockets of socio-economic disparity. The same problems and challenges that plague the developing world, are also within our own backyard. So whether they be global citizens of a country far away or our local neighbors, we need to ensure that our scientific methods are inclusive of the diversity around us. This means actively recruiting participants from under-represented backgrounds within our studies, and ensuring it is practical for them to participate. This again has implications for engineering new technologies that are scalable for greater community inclusion; if the community cannot come to the science lab, the science lab must go and immerse within the community. In making community science relations, it is also important to bring community leaders as partners and consider what the community is willing to participate in, and what may be an undue burden. For instance, a community that has suffered from specific stressors or past trauma maybe sensitive to how trauma-related questions are asked. Thus, the research design of community science is best shaped by a mutual understanding between the academic scientists and the community representatives. Notably, the implications of successful community science research are far-reaching in that insights from a study conducted in the global context can then be used to solve local problems, and vice versa. Indeed, community science can be powerful in providing both local as well as global solutions.

A big hurdle

Finally, I want to touch upon one of the biggest hurdles to globalizing science, and that is dedicated funding. Because of funding agencies, such as the National Institute of Health's Fogarty Institute, I was able to carry out translational research in a global mental health setting. I contributed to the design of novel digital technologies that can enhance brain function and cognition, and successfully demonstrated their utility and efficacy in children and adolescents in urban New Delhi. These studies have systematically included children from all socio-economic strata, even those with a history of neglect and homelessness. I consider making a sustainable difference in these lives as my biggest research accomplishment to-date. Global research funding enabled this work, and the collaborations across multiple international institutions to function like a well-oiled integrated machine.

Now I seek funding to scale-up this initial research in both the global and local setting. This means thoughtfully tailoring the research design to the community in consideration. This further

involves breaking down some of the barriers between basic, translational and implementation science: basic technology needs to be refined & translated to outcomes most relevant to the communities in the new studies. Garnering this funding support has been a challenging endeavor. Indeed, this is the case for all scientific funding, yet, it is especially noted that global science suffers from pilotitis, i.e. the inability to scale-up beyond the initial study. The funding agency is often looking for a clear-cut and simply implementable solution to a global problem, when the reality is that each successful global science project, no matter the scale, is a complex yet systematically-definable blend across the basic, translational and implementation sciences. To globalize science, we need to break down traditional research silos, and scientists, community representatives and funding agencies must align together. While global science funding remains a roller coaster challenge, to remain inspired and persistent, I always remind myself, 'I am here to help!'

References

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world?. *Behavioral and brain sciences*, 33(2-3), 61-83. LINK.

(accessed 1st april, 2019)