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Opinion

Challenges Facing Scientific Research in Developing Countries: 1. The Human Factor

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It is a well-established fact that scientific research is a prerequisite for human and societal development, as the correlation between advances in scientific research and standard of living is obvious across the globe. When one searches for reasons why scientific research in developing countries around the world appears to face seemingly crippling challenges, numerous factors immediately come to mind. Undoubtedly debilitated infrastructure as well as limited resources, including modern equipment and access to new books and journals, print and/or electronic, would be at the top of these challenges

Since the success or failure of any endeavor is dependent upon the individuals entrusted with the task of executing that endeavor, we begin this analysis and reflection with a look at the "Human Factor". Some anecdotal evidence suggests that a significant impediment to progress in this area is lack of interest as well as a diminished understanding of purpose by many "scientists", who engage in research only for their promotion up the employment ladder. Thus, this activity slows down significantly, or even stops completely, once they reach the pinnacle of the ladder. However, in all fairness to those scientists, they are simply a part of a larger problem; they represent a slice of their respective societies and are expressing a great deal of the general malaise.

Many scientists in the developing countries have difficulty communicating (verbal and/or written) in English, the language of today's science. This deficiency presents a barrier between these individuals and the reviewers of their manuscripts as well as their target readership. In addition, they do not gain much benefit from attending international conferences; consequently, they miss the opportunity to sharpen their research and language skills during the limited, yet costly days of these conferences. In this regards, I am reminded of a colleague who had sent a letter to a professor in Europe seeking a scholarship to study for Ph.D. The letter was poorly written in English thus prompting the professor to immediately reject his request. My colleague in his letter had written that he "was fluent in the English language"; the professor responded in writing "No, you are not fluent in the English language".

Some reports show that plagiarism is a common occurrence in publications from developing countries, where it has been reported *that publications retracted for plagiarism are significantly associated with first authors affiliated with lower-income countries* [1]. Although this may be due to lack of awareness of ethical issues, it is also plausible that "copying and pasting" offers an easy and quick way to produce an intended "publication" compared to spending time and effort attempting to put thoughts into one's own words. The latter may be very difficult in light of the poor cachet of the English vocabulary they possess. A case in point, between 2008 and

2012, China retracted the most papers for plagiarism and duplicate publication [2]. In the same study, Finland and Germany had zero publications retracted for the same reason [2].

In some developing countries, science graduates do not have the opportunity to choose a sub-discipline in which to pursue their post-graduate education. They are simply assigned to a sub-discipline according to their graduating class rank. Some disciplines are looked upon as superior to others in the same field, and hence the class rank factor. Furthermore, after obtaining their postgraduate degrees, young scientists are appointed in the same institutes where they obtained their undergraduate and postgraduate education. The saga continues so that they spend their entire careers in those institutions. Very seldom are they given the opportunity to move from one institute to another (almost exclusively when a new institute is established). This inbreeding prevents "cross pollination" of ideas and stifles the opportunity for growth. This is in stark contrast to most developed countries, where even the most talented students are encouraged by their mentors to find positions at other institutions. Indeed, while collaborations among scientists, within an institute or across continents, is the hallmark of successful scientific research in developed countries, scarcity of resources and probably other factors foster selfishness and distrust among scientists in developing countries, depriving them of the opportunities to advance themselves and their societies.

One must hasten to acknowledge that many scientists in developing countries excel in their fields and gain international recognition despite these same prevailing challenges. It is noteworthy that a significant number of distinguished, internationally renowned scientists, even Nobel Laureates, in the developed world are themselves first generation immigrants from developing countries. Many of these scientists arrive in the developed world seeking higher education, but opt not to return to their homeland. This fact alone emphasizes that the surrounding environment, in its social and physical aspects, is capable of motivating or hindering progress. Alternatively, is it possible that these scientists represent a unique population in their respective societies? Regardless, their exodus from developing countries may stifle any opportunity for achieving a "critical mass" of skilled scientists needed for inducing necessary changes. What is really worth studying is why scientists who obtain their higher education and training in the West and return to their original countries become a part of the problem and not a part of the solution. One would expect they would be role models and mentors for upcoming scientists; conversely, they seek refuge and find solace in judging their accomplishments against poor local standards.

In conclusion, a quick look at the situation of scientific research in developing countries reveals that wealth does not create advanced societies. Motivated citizens create advanced societies that in turn create wealth. For developing countries to achieve prolonged significant growth and prosperity there is a need to embark on significant and urgent investments, primarily in their scientists, as it all starts with the "human factor".

Competing Interests

The author declares no competing interests.

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