

Woes of interdisciplinary home bound scientists in India

R. Shibu Daniel and Ashutosh Srivastava

India's indigenous R&D is shifting from one of emulation to one of innovation as passive repatriation of scientists is now in force in India¹. However, the highly skilled interdisciplinary scientists find it difficult to settle down when they return home. The lack of faculty positions, deprived research guidance rights for multidisciplinary degree holders and their ineligibility to take up the Agricultural Research Service (ARS) examination have already been questioned recently².

With specialty knowledge on the rise abroad, the trend of rooting home and pursuing higher studies specific to his/her basic discipline has changed since two decades. Most flying scholars go for sub-discipline specific specialization to earn post-doctoral competencies on experiential learning. Also, Indian universities do not teach innovative and interdisciplinary courses at the Master's level.

We should not be left behind with regard to the modern developments of intensely proliferating newer subjects³. The senior scientific community in the country must nurture novel interdisciplinary research so that the younger scientists can contribute substantially to global science³. Indian research was dormant through the 1980s, but caught up with other nations in an incredibly short time-span in the 1990s, surpassing most G8 nations in research productivity⁴. Indian research publications would account for 5% of the global total share by 2017, propelling the country's global ranking from ninth to sixth position⁵.

Why should India give due credit for interdisciplinary graduates? This is because most research nowadays is interdisciplinary in nature. For example, seafloor observatory research⁶. Integration of toxicological, epidemiological and environmental sciences with socio-economic analysis needs a multidisciplinary approach⁷. In aquaculture, the United States National Strategic Research Plan calls for interdisciplinary research throughout the supply chain 'to improve competitiveness, production efficiency, economic viability, and long-term environmental sustainability...'⁸. The ability to excel among interdiscipli-

nary scientists is necessary for biomedical researchers to be successful⁹. Integrating social science with biomedical research, a multidisciplinary field of HIV-cure research is imminent¹⁰. Even as academics make distinction between inter-, multi-, and trans-disciplinary research¹¹, 'interdisciplinarity' is the persistent term used in health research¹², and a flagship term that combines other subtypes of collaborative research. Both Watson and Crick verily drew core knowledge from different fields and sources in their quest of the first DNA structure¹³. Neuroscientists, neuroanatomists, neurophysiologists, neurochemists, and neuropathologists always needed to work on a multidisciplinary approach rather than discipline-bound compartments¹⁴.

With diseases transcending from bats, rodents, birds and camels to humans, collaborative research has gained greater momentum these days than ever before. Today, there is a confluence of scientific and philosophical approaches mirroring the emergence of team research as the preferred approach in science¹⁵. Indian pharmaceutical firms trying to fill the knowledge gaps except returning scientists to have totally mastered every aspect of pharmaceutical R&D, whereas the returning scientists possess differential singular specialties at the tertiary level¹⁶. Sydney Brenner (B Sc Anatomy and Physiology, M Sc Cytogenetics, MBBS Ch and postdoctorate in molecular biology and neurobiology)¹⁷ and James Watson (graduate and doctoral degrees in zoology, postdoctorate in biochemistry/microbiology)¹⁸ are typical examples of Nobel laureates, who made a breakthrough in science evolving new knowledge that transcended across disciplines.

Returning scientists are undoubtedly a great advantage to Indian science and economy. Thus the national recruitment mechanisms need to be more accessible to such scientists. India is currently funding its resident scientists to visit international organizations of repute abroad and participate in frontline areas of research¹⁹. On the contrary, the scientific challenges of finding new synergies can be more meaningful, if the expat scien-

tists are facilitated a professional research settlement in India, halving the costs of new research consortium. Investment cost and speed of new drugs also get cut by pooling funds upon more positive preclinical drug discoveries.

Globalized reverse migratory scientist recruitment initiative scheme for the direct admission of eligible visiting Indian scientists abroad/persons of Indian origin/non-resident Indians/recent returnee scientists, all entrusted upon agricultural scientists recruitment board on a delineated single-window portal under surmise of Direct Recruitment of Highly Skilled Repatriates Abroad (DRHSRA) would ensure fullest utilization of this available resource pool. They must fare against their peer applicants and the selection exclusively based on a delineated merit list drawn amongst this pool. The bridges and barriers in the context of the widening chasm between science and industry must be reviewed with external consultants. Governmental technology outsourced companies need to be set-up for every science and technological discipline in India, which could act as the technology and investment arm of every national research agency in the country marketing their research outputs in an era of globalizing economies. Repatriating Indian scientists could healthily be here, contributing to these foundations with a stockpile of proven capabilities.

India's share of world output in ten fields of research in the *Web of Science* in descending order of percentage world share is agricultural engineering, tropical medicine, organic chemistry, dairy and animal science, multidisciplinary agriculture, crystallography, integrative and complementary medicine, textiles, medicinal chemistry and agronomy⁴. We must accept in good faith that ethnically varied teams with many of them being immigrants, published more highly cited papers than their less varied counterparts²⁰. Convergence of the dispersed Indians qualifying this DRHSRA initiative for ARS brings in a range of knowledge bases, intersecting newer knowledge disciplines and building an economy based on interdisciplinary knowledge production, sharing and trading.

1. Mashelkar, R. A., *Science*, 2005, **307**(5714), 1415–1417.
2. Padmanabhan, U., *Curr. Sci.*, 2016, **110**(6), 957.
3. Ramachandran, G. N., *Curr. Sci.*, 1985, **53**(7), 345–348.
4. Adams, J., King, C. and Singh, V., *India – Global Research Report*, Thompson Reuters, Publ. Evidence Ltd, UK, A Thompson Reuters Company, 2009, ISBN:1-904431-21-6.
5. Jayaraman, K. S., *Nature News*, doi: 10.1038/nature.2012.12135; <http://www.nature.com/news/india-prepares-to-boost-science-1.12135> (accessed on 18 September 2016).
6. Favali, P. and Beranzoli, L., *Nucl. Instrum. Methods Phys. Res. A*, 2009, **602**, 21–27.
7. Holmes, P., Postle, M., Tuffnell, N., Vencovsky, D. and Zarogiannis, P., *Toxicology*, 2010, **278**(3), 372.
8. NSTC, National Strategic Plan for Federal Aquaculture Research (2014–2019), Inter-agency Working Group on Aquaculture, Committee on Science, National Science and Technology Council, White House, Washington, District of Columbia, USA, 2014.
9. Begg, M. D. *et al.*, *J. Invest. Med.*, 2014, **62**(1), 14–25.
10. Grossman, C. I. *et al.*, *Trends Microbiol.*, 2016, **24**(1), 5–11.
11. Rosenfield, P. L., *Soc. Sci. Med.*, 1992, **35**(11), 1343–1357.
12. Paradis, E. and Reeves, S., *J. Inteprof. Care*, 2012, **27**(2), 113–122.
13. Sharma, O. P., *Curr. Sci.*, 2010, **98**(10), 1269.
14. Tandon P. N., *Curr. Sci.*, 1995, **68**(2), 125–129.
15. Lund, V., Coleman, G., Gunnarsson, S., Appleby, M. C. and Karkinen, K., *Appl. Anim. Behav. Sci.*, 2006, **97**, 37–49.
16. Kale, D., Wiold, D. and Chataway, J., IKD Working Paper No. 17, Draft prepared for SPRU 40th Anniversary Conference, The Future of Science, Technology and Innovation Policy, 11–13 September 2006.
17. Brenner, S., Jacob, F. and Meselson, M., *Nature*, 1961, **190**, 576–81.
18. Watson, J. D. and Crick, F. H. C., *Nature*, 1953, **171**, 737–738.
19. Gulati, R. R., *Curr. Sci.*, 1990, **59**(4), 196–202.
20. Freeman, R. B. and Huang, W., *Nature*, 2014, **513**, 305.

R. Shibu Daniel and Ashutosh Srivastava are in the Amity Institute of Marine Science and Technology, Amity University, Sector 125, Noida 201 303, India.
e-mail: rshibudaniel@gmail.com

FORM IV

Particulars of *Current Science*—as per Form IV under the Rule 8 of the Registration of Newspapers (Central) 1956.

- | | |
|---|--|
| 1. Place of Publication: Bengaluru | 4. Publisher's Name, Nationality and Address: G. Madhavan Indian Current Science Association, Bengaluru 560 080 |
| 2. Periodicity of Publication: Fortnightly | 5. Editor's Name, Nationality and Address: R. Srinivasan Indian Current Science Association, Bengaluru 560 080 |
| 3. Printer's Name and Address: G. Madhavan Current Science Association, Bengaluru 560 080 | 6. Name and Address of the owner: Current Science Association Bengaluru 560 080 |

I, G. Madhavan, hereby declare that the particulars given above are true to the best of my knowledge.

Bengaluru
1 March 2017

(Sd/-)
G. Madhavan
Publisher, *Current Science*