

India needs to be cautious while following the American model of higher education and research

Whenever we talk about reforms in Indian science, we generally end up following the American model as the gold standard. Many do not consider analysing the US system and its limitations in more detail. Others think that we should first reach the current state of American research and only then talk about further modification, probably following the same US model to correct ourselves. There is no doubt that developing countries like India can learn and more to gain from the American model of higher education and research, e.g. transparency in funding and recruitment. But we also need to be aware of probable pitfalls so that we do not repeat the same mistakes and end up wasting our scarce resources and lose few more generations of scientists. From around 1735 when France led the world, till today, history and sociopolitical events indicate that emergence of science superpowers generally followed economic uprising. Not the other way round. Scientists must not take undue advantage of a nation's appetite for heroes. It becomes more pertinent in this era of economic crisis where almost all national governments are hard-pressed to fund research projects. Here I mainly discuss the issue in the context of the US, which we generally try to follow in India.

Lately, the whole process to produce scientists is becoming dysfunctional as evident by the slowing down of innovation and invention¹. Even the mighty pharmaceutical R&D sector is now suffering from acute shortage of new drugs². Few policy-makers in the US have already started asking serious questions about the relevance of the once highly productive post World War II 'input-output model', where monetary input was assumed to be directly proportional to knowledge output, to judge the efficacy of today's public-funded research³. Many argue that scientific output should be judged in terms of its capacity to achieve the desired social outcomes⁴.

We generally forget that immediately after the World War II, the US had no serious scientific and economic competitor. The US higher education and research enterprise was, and still is, much larger than that of any other country. The

most successful and dominant player of the US research was the Department of Defense (DoD). With (i) the end of cold war and the declining role of DoD in translating public-funded R&D into tangible social outcome; (ii) the rise of many serious challengers (mainly the emerging economics in East Asia and South America); (iii) the newly emerging issues (e.g. public health care, global warming and energy crisis) that require greater scientific understanding, needed a different approach to quantify and prioritize national scientific need. These issues arose mainly during the 1980s and put the traditional 'input-output' model under serious threat³. India never has the luxury of being an economic superpower to invest heavily to build a massive infrastructure solely on science education and research, naively thinking that quantity will ensure quality.

Some people already started demanding that the US universities should be restricted to teaching, without wasting public money in the name of research. Now the US universities are more interested to select those candidates as faculties who have developed suitable network and mastered the art to attract grants, than to identify and select candidates who can innovate and invent to generate revenue for the universities. The present model completely absolves the universities from the responsibility of spending tax-payers' money. In its most optimistic and fair terms, keeping aside the regular allegations of nepotism and corruption in recruitment and funding, Indian research institutes and universities are no different.

The lack of strategic thinking, focus and coordination between government, other funding agencies and universities, and by unrealistic expectations of what money could buy are becoming more evident these days^{1,4}. Some of the problems, including that of the 'publish or perish' model started long ago during the 1970s, as indicated in the book, *Heraclitean Fire: Sketches from a Life before Nature*, by the famous biologist Erwin Chargaff. Later, it became more of a global problem as initial success of the American 'input-output' and 'publish or perish' model was adopted by many

countries, including India, albeit half-heartedly.

The problem worsened as the most important parameter to quantify productivity and efficacy of our publication-based academic research started losing its credibility. The 'monopolistic' business of the academic publication industry has become one of the fastest-growing lucrative businesses without almost any self-regulation or government oversight⁵. Today almost anything can be published in journals, claiming to be peer-reviewed⁶. It has significantly contributed towards deterioration of the peer-review process, rising incidents of scientific misconducts and higher acceptance of such misconducts among researchers⁷. China is a good example in this regard with increasing incidences of plagiarism and other forms of scientific misconduct. Chinese journals find a whopping 31% of submissions are plagiarized.

It has serious consequences not only on over all scientific environment but also on careers of individual researcher – as recruitment, funding, promotion and fame, which can be defined as 'institutional power to influence future direction in any specific area', depends largely on that single parameter. Credibility of data, its interpretation and conclusion seem to depend more on individual researcher. Any researcher adhering to the higher standard of professional ethics and scientific understanding is now under severe threat.

Lack of accountability partly explains low salary, poor working conditions, poor mentoring, low attraction and lower retention of talented students in the US⁸. It reduced support towards science not only among talented students, but also among policy-makers and the general public for this vital sector, which was, still is and will remain crucial for a higher quality of living in the Western countries. Any country ambitious enough to have a knowledge-based economy, as some Indian policy-makers like to achieve, needs to acknowledge that increasing dominance of mediocrity is a serious threat today than ever before.

Past achievements will sustain a competitive edge for a shorter period of time in this age of higher mobility of man-

power and development in communication technology. It increases the necessity for faster development of novel, innovative products and/or technology. Many a times the policy-makers and scientists either could not understand or conveniently ignored the bigger picture, as there are not many subject matter experts willing to play the role of a devil's advocate. It seems that exaggerated data fuelled the hype for *Jatropha* based bio-fuel programmes in countries like India⁹. Another recent casualty of over-selling or the culture of hype became clearer when many high-profile players in the pharmaceutical industry dropped their plans and altogether pulled out from the RNA interference research, popularly known as RNAi¹⁰.

Such incidents in both public and private-funded R&D initiatives, even in

developed countries like USA, are not rare now a days, with far-reaching consequences for the company, the country and science itself. Developing countries like India that have fewer resources need to learn from both the successes and mistakes of more successful countries like USA. Ignoring their mistakes will be no less fatal. India needs to prepare itself to adopt the changing world where there will be no science superpower to follow.

1. Sarewitz, D., *Nature*, 2011, **471**, 137.
2. Ledford, H., *Nature*, 2011, **480**, 16–17.
3. Sarewitz, D., 23 September 2010; http://archives.democrats.science.house.gov/Media/file/Commdocs/hearings/2010/Research/23sep/Sarewitz_Testimony.pdf
4. Sarewitz, D., *Nature*, 2010, **468**, 135.
5. Monbiot, G., *The Guardian*, 2011; <http://www.guardian.co.uk/commentisfree/>

2011/aug/29/academic-publishers-murdoch-socialist

6. Colquhoun, D., *The Guardian*, 2011; <http://www.guardian.co.uk/science/2011/sep/05/publish-perish-peer-review-science>
7. Titus, S. L., Wells, J. A. and Rhoades, L. J., *Nature*, 2008, **453**, 980–982.
8. Editorial, *Nature Biotechnol.*, 2010, **28**, 181.
9. Orange, R., *The National*, 2009; <http://www.thenational.ae/business/jatropha-seeds-yeild-little-hope-for-indias-oil-dream>
10. Pollack, A., *The New York Times*, 2011; http://www.nytimes.com/2011/02/08/science/08rna.html?_r=1&pagewanted=all

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Lack of inspiring teachers

Following upon the points raised by Upadhyaya¹, I wish to draw upon my experience of preferentially recruiting PhD students from the Indian subcontinent into my research group. My interest in doing so is to provide opportunities for at least a few from my country to gain western higher education experience.

Sadly, almost all the students from the Indian subcontinent whom I have managed to recruit to work with me, show the following characteristics rather uniformly: (1) Display no knowledge of basic biology, which I consider extremely vital, although their PhD projects pertain to current ecological questions demanding application of contemporary analytical and computational methods. (2) Lack skills of basic computational and analytical

techniques. (3) Lack reasoning and logical-thinking skills. (4) Show no signs of creativity and originality. (5) Speak and write intolerable English. Western higher education – even at undergraduate level – is driven by self-learning paradigm.

In the 1990s when I was a member of the Life Sciences Programme Advisory Committee, Department of Science and Technology, Government of India, one of the discussions we had was on strengthening research skills. I argued that this needs to be done from the undergraduate level. Sadly, my arguments were pooh-pooed by the then Chairperson of the Committee.

What ails Indian higher education, especially science education, is the severe deficiency of inspiring teachers. I inter-

pret the word 'quality' (sensu Upadhyaya) as 'inspiring'. Persons with no motivation and excitement to teach science occupy positions as teachers in colleges and universities in India. Until this trend continues, I see no salvation to Indian higher education in general and science education in particular.

1. Upadhyaya, G. S., *Curr. Sci.*, 2012, **100**, 803.

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The future of geology

Valdiya, writing with his customary flair and acuity, has provided a thought-provoking account of the pathetic condition of our promising geologists, and the health of our national research organizations related to earth sciences and their leadership¹. He has rightly pointed out that the views of specialists are not sought/or are overlooked while undertaking major earth science-related projects in the country, where geology plays a main role.

The presence of the same group of individuals who dominate almost all the decision-making bodies, advisory committees and various science Academies over the years has resulted in the present poor status of geological education and research in the country. In this context, the article by Valdiya is timely and deserves serious consideration and re-thinking. If corrective steps are not taken the future of geology which plays an

important role in our national development will be bleak.

1. Valdiya, K. S., *Curr. Sci.*, 2012, **102**, 581–589.

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