Is India open to scientific criticism?

A geophysicist from the United States (US) has warned India on the potential dangers of an earthquake at the proposed nuclear power plant at Jaitapur, Maharashtra, without realizing the dire consequences[1]. When the scientist landed in Delhi airport en route to Bhutan in May 2012, he was swiftly deported back to the US. It is sad to learn how impolitely the scientist was treated by airport officials[1]. India has a long history of respecting foreign scholars. So the question is how did this unfortunate incident happen in the world's largest democracy?

When Japan's Fukushima nuclear power plant disaster sent the alarm bell globally, people started to question the safety of nuclear plants in India[2]. Although the engineers have already mentioned that the nuclear plants located along the coastal areas are susceptible to earthquakes and tsunamis, the Atomic Energy Commission continues to reassure the public that the plants are safe. India has already signed the civilian nuclear co-operative deal with the US; so reversing the policy may not be all that easy[3]. But scientists state that threats facing India's nuclear power plants from natural disasters, especially earthquakes still remain[3].

When academicians express their scientific views with the support of data to portray the potential dangers of earthquakes to nuclear power plant sites, does it warrant ill-treatment and deportation? So, it is about time for the Indian science community to make sure that this sort of amateurish handling of scientists does not occur again.

1. Bagla, P., *Science*, 2012, **388**, 1275.
2. Agoramoorthy, G., *Nature*, 2012, **481**, 145.
3. Bilham, R. and Gaur, V. K., *Curr. Sci.*, 2011, **101**, 1275–1281.

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Dual-use dual-impact life science research

Few technologies in recent years have provoked as much heated controversy and sound bites as genetically modified (GM) crops. Opinion of lay press has been largely tilted towards the 'nay' sayers for GM crops, particularly food crops, regardless of the opinion of a large number of informed scientists whose voice is muffled by the biased activists. In this regard the article by Gupta[1] is refreshingly illuminating. Dual-use and dual-impact research is intended for public good, but can be misused, or has some inherent risk. The latter has to be assessed and minimized. The author has compared the permission given by the regulating authorities in the US for publication of the results of two important studies involving genetic engineering research on influenza virus after considerable informed debate, with the long-term moratorium on field testing of GM crops, particularly those carrying the *Bt* trait – *Bt* cotton and *Bt* brinjal. Basically the opposition is regarding assumed health and environment risks, and subverting the interest of farmers by multinational seed companies. What can be more convincing regarding the safety to human health of *Bt* tweaked plants than the fact that *Bt* food grains are being consumed in the US since many years. Are the US regulatory authorities so perverse as to allow their population to be poisoned and even if they are, will the public allow them to do so? Why does India have to follow the example of European countries which oppose GM technology, although even in Europe the situation is gradually changing in favour of the use of GM technology. For them food and nutrition security is not as serious a problem as it is for India. Some degree of caution is however needed since the Indian population is undernourished and probably genetically different. But a ban of 10 years even for limited and controlled field trials makes little sense. Regarding danger to biodiversity, even if a targeted useful trait does escape and contaminates other crops, why should that affect overall biodiversity? Biodiversity is being constantly threatened even by varieties developed by conventional or molecular breeding technologies, because farmers will favour using a variety that performs better, sometimes leading to monoculture. Biodiversity is already protected and can be protected through technological options for preserving germplasm. Resistance in targeted insects to chemical and biological agents is also known to occur. Continuing research towards technological options to overcome this problem is needed and options like refugea, gene stacking and others mentioned in the article do exist.

As a nutrition scientist my worry is that in the debate over *Bt* crops, useful bio-fortified food crops, many developed by Indian scientists which can address the problem of rampant micronutrient (vitamin and minerals) deficiencies, and protein energy malnutrition in India are also put in cold storage. Options such as reducing post-harvest losses, minimizing diversion of land to non-food crop uses, development of safer organic methods, etc. have certainly to be exploited, but that will not be sufficient to meet the challenge of population increase, and biotic and abiotic stresses, and modern biotechnological tools will have to be used to address them. A strong, unbiased, transparent, regulatory mechanism/body is indeed needed, but such a body should have scientists who know the subject. Even if some of them are involved in genetic engineering research, they are certainly not interested in harming people and the Indian interest. There is no substitute for highest ethical standards on the part of scientists. Regarding commercial interest of seed companies, the Government has to provide a suitable safety net through legislation.

The Indian Government is using double standards in tackling opposition to nuclear power and GM crops. Indian scientists need to be more proactive and interact with print and audiovisual media through articles, debates, etc. so that people do not get a one-sided version. Allegedly adverse experiences reported by grassroot workers should be documented and evidence-based explanations provided after investigating them instead of discarding them off-hand.

1. Gupta, P. K., *Curr. Sci.*, 2012, **103**, 995–1002.

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Top Indian higher education institutions and the Leiden and Scimago rankings

We now have releases from both the Leiden Ranking 2011/2012 (http://www.leidenranking.com/default.aspx) and the *Scimago Institutions Rankings* (*SIR*) *World Reports* (http://www.scimagolab.com/, http://www.scimagoir.com/) covering the 2005–09 period.

The Leiden Ranking evaluates the scientific performance of 500 major universities worldwide using *Web of Science* (*WoS*) data of Thomson Reuters. Only publications (document types article, letter and review) in the sciences and the social sciences are included, whereas publications in the arts and humanities are excluded. A new impact indicator, the proportion top 10% publications ($PP_{top\ 10\%}$), is introduced. This is the proportion of the publications of a university that, compared with other similar publications, belong to the top 10% most frequently cited. Publications are considered similar if they have been published in the same field and the same publication year, and if they have the same document type. In this sense, it has a normalizing effect across fields, publication year and document type, and is now gaining acceptance as a robust quality indicator. The ratio $q = PP_{top\ 10\%}/100$, allows one to fractionalize this proxy.

Similarly, the *SIR World Reports* quantify the research performance of 3042 leading research institutions in the world. Now, citation and publication data from *Scopus* (www.scopus.com), an Elsevier product, are used. We shall look at the 2011 report (since then, the 2012 report covering the 2006–2010 period has been released) as it covers the period 2005–2009 for direct comparison with the Leiden Ranking, which covers the identical period. *Scopus* is a more comprehensive database than *WoS* and accounts for nearly 80% of all research. This will become clear when we present the results below.

Although bibliometric data are available in the form of six indicators representing categories like scientific impact, thematic specialization, output size and international collaboration networks of the institutions, we shall focus on the quantity proxy, the O (or output) indicator which is a measure of the quantity or size of the publication output of an institution and one quality proxy, ER (or excellence rate), which indicates the percentage of scientific output of an institution that is included into the set formed by 10% of the most cited papers in their respective scientific fields. Again, the ratio q = ER/10, allows one to fractionalize this proxy.

In both the Leiden and Scimago rankings, if we consider q to be the quality

Table 1. Comparison of the performance of four top Indian higher education institutions with that of Harvard University and four other Western institutions with comparable output

	Leiden 2005–2009: *WoS*				*Scimago* 2005–2009: *Scopus*			
Institution	P	q = PP	q^2	X	P	q = ER	q^2	X
Top world higher education institutions								
Harvard Univ	33,511	0.225	0.0506	1696.49	69,995	0.357	0.1274	8920.79
Ecole Polytech Fédérale Lausan	4,790	0.188	0.0353	169.30	13,464	0.202	0.0408	549.39
Carnegie Mellon Univ	3,577	0.197	0.0388	138.82	12,720	0.165	0.0272	346.30
Univ Dublin Trinity Coll	2,692	0.147	0.0216	58.17	6,985	0.191	0.0365	254.82
Univ Dundee	2,457	0.140	0.0196	48.16	5,381	0.257	0.0660	355.41
Four top Indian higher education institutions								
Indian Inst Sci	4,239	0.085	0.0072	30.63	8,042	0.119	0.0142	113.88
Indian Inst Technol Kharagpur	3,204	0.090	0.0081	25.95	6,213	0.094	0.0088	54.90
Indian Inst Technol Madras	2,587	0.088	0.0077	20.03	4,990	0.074	0.0055	27.33
Indian Inst Technol Delhi	2,502	0.081	0.0066	16.42	5,583	0.086	0.0074	41.29

P is the number of papers published during 2005–09; PP is the proportion of the publications belonging to the top 10% most frequently cited according to the Leiden Ranking; ER is the proportion of scientific output of an institution that is included into the set formed by 10% of the most cited papers in their respective scientific fields from the Scimago Ranking and X is the second-order indicator of performance in each case.