Decline of quality science in India

Last year, the Prime Minister of India bemoaned the decreasing number of scientific research publications from scientists in India. And, now, Kumar has added another supporting aspect to this decline of science in India. Kumar has analysed time-series data, obtained from a UGC Annual Report, of the number of doctorates in science, engineering/technology (E/T), arts, commerce, and education. By fitting the data in a mathematical model, a sort of Marchetti Plot, and by extrapolation, Kumar has concluded that the share of doctorates in science relative to the arts in India will continue to decrease while that of E/T has reached a saturation level. Being an important conclusion, one must ask two questions: (i) What is the quality of the data? How credible is it? (ii) Why are we more concerned about the quantity of our S&T rather than the quality?

As members of an editorial team to compile an AICTE commissioned handbook on 'Technical Education in Independent India 1947–1997' published by AICTE in 1999, we struggled hard to get credible data on year-wise turn out of graduates and post graduates in the country from such sources as UGC, AICTE, Association of Indian Universities, MHRD, Planning Commission, DST, and Institute of Manpower Training. We were terribly depressed to find that data from different sources were at considerable variance with each other. In some cases, the same organization had given different data in different documents. Clearly, it seems that no organization has taken the job of collecting primary or even secondary data regularly and seriously. The UGC data for E/T used by Kumar for analysis is certainly suspect. Surely, a sharp jump from 298 doctorates in the year 1997 to 744 in 1998 hardly makes sense. As far as I know, the five original IITs have produced at least 400 doctorates, if not more, per year during 1990s. As a crude estimate, the rest of the academic institutions dealing with E/T must have added another 150 doctorates per year. The IIT numbers do include about 30–40% doctorates from science and humanity departments. However, we must keep in mind that most of these science theses are applied and technology-oriented. My purpose here is to point to the need for a credible and quality data bank on a national level for S&T manpower and research output.

The quality of our research hardly seems to concern anybody in our country. Our Indian science journals have a very low impact factor. The citation index of papers published from India is, in general, rather poor. As per the scientometric data of the Institute of Scientific Information, USA, the number of 'most highly cited scientists' in different scientific fields from India is miserably few. The quality of Ph.D theses in solid state physics from various universities which I have examined makes me sad. During my tenure as the Director of IIT Kharagpur, I have read carefully reports of examiners for some 10000 theses, and another 400 or so at IIT Delhi as the Dean, PG studies. A good number of IIT theses are undoubtedly world class. Nevertheless, the number of marginal ones is not insignificant and is increasing with time.

The successful researchers will support my statement that good financial support and good infrastructure may help but are by no means absolutely essential for quality research. Indeed, some of the outstanding research works in India and abroad have been done under austere and challenging conditions. Only excellence can breed excellence. What we need badly for excellence is a very critical peer review and audit of our scientific research output. The day we will not allow almost any poor work being presented by a researcher without a challenge in our numerous scientific conferences, we would have ushered in an era of healthy scientific temper in our country. At present, such an exercise is considered impolite and a personal attack.

With the advent of IT era and e-publications, MHRD should make it mandatory to have Ph.D theses available in e-form in a central website or in the respective institutional e-libraries which hopefully will get connected soon. A central website could be created and maintained by a suitable organization for the purpose of directly providing some basic data about Ph.D theses from all institutions. Basic data may include a brief synopsis of the thesis, publications arising out of the thesis, names of the examiners, and possibly grades for the thesis (a practice in many universities in the West). Such steps would enhance transparency and may minimize intentional/unintentional duplication of research work and related unethical practices. With such data, our scientometric scientists may be able to do a more critical and in-depth scientific analysis of our research output.

Finally, I feel that our science in India will be better off if we are lean, mean and sheen, rather than being fat, mat and flat. Let us remember that the Global Knowledge Society of today will recognize only quality research output.

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Biotechnology, ‘two cultures’ and battles among scientists

There is considerable euphoria nowadays about biotechnological research. Biologists from diverse fields: molecular biology, tissue culture, molecular genetics, etc. are engaged in productive research, with specific aims to benefit humanity. But while these scientists are upbeat, one also gets an impression of two cultures having come into being— with ‘subcellular’ biologists in one camp and ‘organismal’ biologists in the other. This takes us to the recurring debate about the two cultures.

In the conventional biology departments of Indian universities, the feeling
that the academic community is polarized into two cultures, generally comes when colleagues, cutting across disciplines, brush against each other. In my experience, the biotechnologist/sub-cellular biologist asserts that he is doing ‘hard science’, employing state-of-the-art technology, ideas and concepts. He also emphasizes his accomplishments in fund generation by alluding to the ‘crores’ he has brought to the institution from national and international agencies. But if science is all about money and the paraphernalia it brings, not to mention the hype and the power to hire and fire manpower, much like the CEO of a private enterprise, then the organisational biologist usually comes second.

It can be argued, of course, that actually there cannot be any ‘two cultures’ in biological research and if sophisticated instrumentation, heavy funding, etc. indicate something to the effect, then it is only a superficial categorisation. After all, biologists of all hues are trying to understand patterns and processes, at different levels of biological organization; some at the molecular and sub-cellular levels, others at the level of organism, populations and communities. Moreover, in our times the kind of synergy between different branches of biology is like something never seen before. While molecular techniques are being increasingly employed in ecological, taxonomic, eco-remediation and physiological work, the ecologist has much to offer a biotechnologist, say a scientist developing genetically modified varieties of plants. (Witness the recent debate on Bt cotton, where it was clear that without prior ecological testing of the hybrid plants, it would be foolish to use GM seeds.) Therefore the differences, if any, are in terms of attitudes, perceptions and the importance given to certain areas at the national and international level, and also to the funding available.

As a member of the academic community, I witness acrimonious battles whenever the two cultures clash. The battles are related as much to resources (such as space, funds, etc.) as they are to academic matters. But when biologists of one camp shout across the fence to those on the other side, asserting that theirs is the only ‘true science’ and what they are doing is also being done in the ‘West’, then I am reminded of a passage from a short story by Amitav Ghosh. The story – ‘The Imam and the Indian’ – is that the author, staying for some months in rural Egypt while doing his research at the University of Alexandria, gets to confront the Imam of the village who is horrified to learn that in the Indian doctor’s native country people burn (cremate) their dead. The Imam is particularly stung when told that even in the west, people sometimes also burn their dead. As Ghosh writes:

(‘The Imam) turned around and laughed. ‘He’s lying,’ he said to the crowd. ‘They don’t burn their dead in the West. They’re not an ignorant people. They’re advanced; they’re educated, they have science, they have guns and tanks and bombs.’

‘We have them too!’ I shouted back at him. I was as confused now as I was angry. ‘In my country we have all those things too’, I said to the crowd. ‘We have guns and tanks and bombs. And they’re better than anything you have – we’re way ahead of you.’

The Imam could no longer disguise his anger. ‘I tell you, he’s lying,’ he said. ‘Our guns and bombs are much better than theirs. Ours are second only to the West’s.’

‘It is you who’s lying,’ I said. ‘You know nothing about this. Ours are much better. Why, in my country we’ve even had a nuclear explosion. You won’t be able to match that in a hundred years.’

So there we were, the Imam and I, delegates from two superseded civilisations vying with each other to lay claim to the violence of the West.

At that moment, despite the vast gap that lay between us, we understood each other perfectly. We were both traveling, he and I; we were traveling in the West.


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Interlinking of Indian rivers

According to the National Water Policy, water is a prime natural resource for humans and, hence, a precious national asset. Nowadays, it is hard to find freshwater due to growth in population, agricultural and industrial activities, and contamination of water resources. By 2020, the global population is expected to reach up to 7.9 billion and the world may be under great scarcity for freshwater. India is also expected to face water problem in the coming years. The country receives about 4000 km³ of water as precipitation annually, but due to different precipitation patterns and mismanagement, it often leads to wastage. In view of this interlinking of Indian rivers, a highly ambitious and massive project is planned, which is under debate.

Arthur Cotton was the first person who originally conceived the idea of networking the rivers about two centuries ago, but the idea of interlinking Indian rivers was revived a few decades ago independently by M. Visvesvarayya, K. L. Rao and D. J. Dastur. Recently, the Supreme Court of India ordered the Government of India on 31 October 2002, to complete this project within the next 12–15 years. In response to this order, the Government of India appointed a Task Force headed by Suresh Prabhu. Scientists, engineers, ecologists, biologists and policy makers started to ponder over the technical, economic and eco-friendly feasibility of this gigantic project costing about Rs 560,000...