Science Research in India: Universities, Research Institutes and Everything In-between

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This comment on Pushpa M Bhargava's endorsement of the role of autonomous research institutes (EPW, August 2, 2008) as opposed to Gautam R Desiraju's opinion that the creation of such institutes was a singular blunder (EPW, June 14, 2008) holds that while the real backbone of our education is to be found within the traditional university system, the faculty at research institutions need more support in doing pure research.

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I found both Pushpa M Bhargava's 'On the Organisation of Science Research in India' (August 2, 2008) and Gautam R Desiraju's 'Science Education and Research in India' (June 14, 2008) on the state of Indian science interesting; each had valuable inputs to make to the discussions which are currently taking place on the state of science in India. I am not in complete accord with either article though in partial agreement with both; this piece will present a third perspective on the issue at hand.

What most people agree about is that the state of Indian science at present leaves much to be desired. I would like to repeat here what I have said in other contexts ('Science in the Sick Bay', *The Times of India*, April 23, 2008): it is unreasonable to expect Indian science to be more than a microcosm of Indian society. The analogy with India's recent gold medal at the Olympics is hard to resist: first, it represents an individual achievement, born of individual training and private endeavour. Second, such a medal does not signify anything about our overall profile in the field of athletics. In line with this analogy, it is fair to say that only a small fraction of our scientists have solid international profiles (by this I do not necessarily mean world-class; I mean only people who publish regularly in international journals and are constantly invited by colleagues abroad to collaborate and give talks); this is undoubtedly a small fraction compared to most western countries, but what is troubling is that it may become smaller than the contributions of countries such as Korea or Singapore, not to speak of China, all of which have made enormous investments in their scientific potential. What is even more troubling is that we in India are widely recognised as having greater intrinsic scientific talent than some of the countries mentioned above; Indian scientists working abroad are seen to be major contributors to any scientific community one chooses to sample.

Somewhere In-between

The discussions that are taking place currently are centred on precisely this issue – what are we doing wrong here, why isn't the talent that is so e'vident once exported, allowed to flourish in its home environment? A major issue, and one on which Bhargava and Desiraju differ strongly, is the role of autonomous research institutes versus universities; the former strongly endorses the role of institutions whose only raison d'etre is research, while the latter feels that the creation of these institutions "was the single biggest blunder that was committed in the Indian scientific arena". A third viewpoint, somewhere in between, is possible; and this is the point of this article.

As a habitué of research institutes (both as a professor at one in India, and a long-time visiting scientist at Commissariat al Energie Atomique (CEA) Saclay in France), I might be expected to be strongly in their favour. The following remarks might therefore surprise those who believe in situational predictability – I believe that there is much to be said for Desiraju's criticism of research institutions, even to the point that some of them are a "waste of valuable real estate". I feel, however (in line with some of the examples that Bhargava has taken), that there are at least some "good" ones – good as defined by a meaningful average of productivity, rather than strong individual fluctuations of active talent embedded in a sea of mediocrity. Even in institutions characterised by the latter scenario, the presence of islands of robust science, conducted in the face of great odds, makes it hard to find simplistic solutions: it is not fair to those who are fulfilling their mandate to change the ground rules of their institutions and transform them into universities, having hired them to do basic research in the first place

This said, I agree with many of Desiraju's comments, e g, that research councils and the institutes they parented were often put in place too fast, with not enough care invested in hiring and infrastructure. A broad categorisation of hired faculty at such institutions results in at least three classes: those who are doing the research they were hired to do, very well; those who did it well for a time and then lapsed; and, alas, those who have never done anything and continue with their inaction. The difficulty of assessing today's widely specialised research in any meaningful way is a major problem too: how does one distinguish between someone who grapples with a difficult problem and publishes nothing, and someone who likewise publishes nothing but, in addition, also thinks of nothing? Numbers of publications alone cannot be a guideline – today's science, in certain subfields, allows the mindless application of techniques to generate repetitive papers with only slight variations, much as slight variants of recipes allow a restaurant to produce different versions of the same dish on different days.

Productivity and Politics

It should also be noted that those who manage to perform well in most of our research institutions are usually fighting enormous battles just to survive; especially if they are not playing politics as well. Research careers are typically not well-rewarded and, in today's society, not particularly well-respected; added to this is the value not added of the physical and mental surroundings they have to work in. While all of this is true of universities as well, the "autonomous" nature of most research institutes sets them apart from the democracy of most universities: the problems that can result from autocracies are entirely predictable and hardly need spelling out, but suffice it to say that merit is usually the first casualty of politics. The fact that scientists whose spirits might have been repeatedly broken by political manoeuvres are still able to be productive, is nothing short of a miracle; they need to be supported, and not discouraged. Closing down research institutes, or modifying them out of all recognition, is thus not a fair solution – at least not for the active researchers within them.

Universities have their heroes too; there are those who teach, and also do good research, as both Desiraju and Bhargava acknowledge. It is, however, no accident that such dual productivity is more pronounced in universities which have long liberal traditions; the atmosphere at most such universities is immediately more respectful of the individual faculty member, who then feels more encouraged to contribute of his best than his counterpart at one of the more monolithic research institutes. Typically, however, the research output of the average university is not significant, as Bhargava says; few university faculty get the awards or make the research impact that faculty members at pure research institutions may do (or should I say, are allowed to do). Were we

to take draconian measures and shut down/totally transform all our research institutes, the universities alone would scarcely be able, even with greatly enhanced funding and facilities, to make up for their lack.

Clearly, we need the research base provided by our research institutions, given that innovation in the modern world is spurred by science and technology; clearly, also, we require educational institutions where the young are trained to the levels of excellence that today's globalised world demands. Should we ban one at the expense of the other? Do we, as is often the case now, really need to force research faculty to teach in order to compensate for what some may see as the mistakes of their birth or, as is clearly the case, the fact that many of them are not justifying their existence? If we do this, do we not risk on the one hand, the indifferent teaching that might well accompany such coercion; and, even more importantly, a decrease in the research output of the small fraction of good researchers we have? Would university faculty be content with sudden rules whereby significant research output was mandatory, rather than optional? If not, why do people expect scientists hired to do pure research to adapt their skills to arbitrary changes in ground rules? It is no secret that the promotional ladder is easier to climb at most universities, following well-oiled clocks of chronology, and that salary scales are far better in many universities, especially, for example, the Indian Institutes of Technology; those who had given up such facilities and embarked on the much more uncertain terrains of professional advancement within research institutions (where promotions are known to come late, or never, and salaries can remain relatively low till retirement) out of their love of pure research, might well be expected to resent these changes.

Some say that the introduction of institutions such as the Indian Institute of Science Education and Research (IISER's), where both research and teaching are on an equal footing, might solve this problem. Possibly so, at least in the sense that those faculty members who are being hired there are made well aware of their remits in advance of their hiring, rather than after the fact. However, it is not evident that the quality and the breadth of expertise that is being taken on at these fledgling institutes is, in any intrinsic sense, better than that at our traditional universities; and the question that Desiraju poses is rather relevant – why not make that investment to equip existing universities better, rather than giving up on them? As he says, the range of subjects in the arts and sciences taught in traditional universities unconsciously endows students with more liberal educational perspectives than these purely scientific institutions allow; equally importantly, the spread of subjects even within the sciences in some of the latter is not as fluent as it is in traditional universities, where skill sets and areas have been built up over decades. Students from some of these new age universities tell stories of how they are taught nanotechnology without the first idea of quantum mechanics, of how biodiversity is explained without basic biology. To be sure, nanotechnology and biodiversity are in the top 10 of science today, while quantum mechanics and biology sound slightly fuddy-duddy in this context; but educationists must surely accept that just as biodiversity cannot be understood without biology, so quantum mechanics is crucial to the understanding of nanoscales?

Teaching and Research

In the end, I agree with Desiraju that the real backbone of our education is to be found within our traditional university system; they need to be supported, improved and better funded, instead of being implicitly discarded in favour of their new age counterparts. Such investment will certainly reinforce an increasingly decrepit and neglected higher educational system (and perhaps reverse the trend where students who can afford it choose to leave India after standard XII these days, instead of waiting till their graduation), and give it back some of its earlier respect. On the other hand, I agree also with Bhargava that research institutions too – or at least the core of productive faculty among them – need more, rather than less, encouragement and support in doing pure research. Research institutes like those in the French system continue to produce front-ranking research, with no mandatory teaching duties of any sort; thus giving the lie to administrators who argue that teaching is a necessary component of good research.

Finally, the choice of whether an academic anywhere – be he at a (traditional) university or a research institute – would like to diversify into areas apart from the principal mandate for which he was hired, should remain strictly optional; the counterpoint being that his adherence to, and excellence in, his principal mandate, should be just as strictly enforced. The reasons for this are at once pragmatic – forced changes do not usually produce good results – and deep – the love of intellectual freedom is surely as much a reason for the choice of an academic scientist's profession as is the love of science. A little respect for the freedom of choice of individuals who have chosen to train long years, and abjured the lure of more lucrative professions, for the love of the intellectual life and its inherent liberties, will surely go a long way.