

Science at IISc – Good, great, Outstanding, ...?

An inner dialogue

H S Mukunda, Advisor, ABETS, IISc

Having lived in and with an institution for forty years (including six years of student life), one is apt to develop attitudes that may amount to self-praise or being overly critical. Notwithstanding these, one has opportunity to examine the institution from outside too, when you have visitors who make observations, or when you need to make careful observations during your visit to other institutions both in and outside the country.

Clearly, as far as I am aware, within India, IISc stands out as an extremely worthwhile place to stay and work either in basic or engineering sciences, for, you brush shoulders with a number of colleagues from various disciplines who can think deeply and who can provoke you to think deeply as well. Also it has always been headed by distinguished men whose engagement with science is unquestionable and successive governments have been respectful of this status. Does this entitle IISc to claim camaraderie with the best institutions in the World? Some faculty in authority (and some others as well) wish to assert this. And some who were in authority state that much is desired before achieving this. Either way, the subject needs examination by all and action on behalf of the men in authority. Has such an act not happened in the past or is it happening at the present are the questions for this dialogue. I have titled this as “an inner dialogue”, for most of what is said here has been brought up for informal conversations with several distinguished men of science at IISc, but left behind for me to engage in a more assiduous inner dialogue.

Over years, several debates on teaching vs. research, research in engineering departments vs. science departments, meaning and role of consultancy in faculty output, and commercialization of intellectual property rights have taken place more informally in select groups rather than as specifically flagged items for full scale discussion. Many of these have had inputs more personalized than institutionally focused.

Teaching has traditionally been the main forte of engineering departments; it is only in the nineties that science departments also introduced course requirements for research and this needed classroom teaching by science faculty. Many men of importance have generally regarded teaching as an unavoidable chore rather than a valuable professional activity; there used to be statements of slighting the teaching activity, some publicly in meetings and certainly more in private discussions. Hence teaching quality has remained at an average or poor level ~~for~~ over decades with perhaps cursory attention to repair or upgrade. By international standards, this will place IISc not in any great favor. Arguments are made that what is important is research. The connecting link between good teaching and students who could be fired up to do some interesting research has been glossed over. The fact that good teaching is still practiced perhaps in pockets is in spite-of rather than due to a supportive action towards teaching. This does not mean excellence in teaching has not been honored. Yes, they have been. But the atmosphere of the Institute does not breathe even partly of excellence in teaching.

There have been significant differences in attitudes on research between the science and engineering faculties. What is practiced in science departments is understood to be research indeed. What is done in the name of research in engineering departments meets with the expectation of research only in parts. As such, there is an undercurrent of feeling that research in engineering departments does not measure up to that in science departments. Engineering departments also do not make their case of good science very strongly – there is no “lobby” in this regard. The lobby for goodness of science in science departments is far too well “understood” to be even doubted. But the claim to superior science in science departments is faced with answering the typical question: how many Nobel Laureates does institute have? Why is it that in the last fifty years, IISc has not been able to produce even one ~~good~~ Nobel Laureate? It is not that the lack of a Nobel tag makes the quality of science poor, but it puts burden on making complex looking and long-winded arguments about the quality of our science. One often invokes the conclusions of the survey done on the standing of scientific institutions all over the world based on some select criteria that states that IISc is 18th amongst the institutions in the world and some others that may say IISc is No. 1 in the Asia Pacific region, etc, etc. These do not always carry the same weight as would be the case of having a “Nobel Laureate”. One message is clear: Gaining position within the institution by looking down upon engineering research is not the best thing to do, for, one might be attempting to throw stones living in a glass house. As such, it is perhaps appropriate to ask a more relevant question; Can institutions not aim to do “Nobel” quality science – in science or engineering departments? Stated differently, should faculty not debate questions about what class of problems in each area to address? Some problems are pedantic, the origin of which will lie in some path breaking work elsewhere, pursuit of which will assure publications, will receive pat on the back by the more distinguished or those scientists established overseas, perhaps more of western origin. There are many reasons for this. Such an act assures quicker recognition, a possible sabbatical, a visiting position for a few months or at the least, an invited lecture. If one does path breaking work here that disposes of a concept, disproves a hypothesis originated overseas, it is far more difficult to be recognized at least initially; it is an uphill task. One would need to keep attending meetings in several parts of the world and argue with each group about the sanity of one’s own approach vis-à-vis the existing thinking.

There is an important distinguishing feature about working in science and engineering departments. In science departments the majority of the work can address questions that are universal and with marginal connectivity to “nation”. Perhaps the choice of the problem could be such as to be of national interest as well. In engineering, a significant part of one’s work has to be of national interest, for otherwise the connectivity with the real world becomes weak if not lost. In institutions in developed nations, the meaning and relevance of the work for the nation are not different from that for the rest of the world and hence one does not need to debate. In developing countries, one needs to do work in engineering departments that would help build up the research and development efforts somewhat directly. Problems that arise in defense and space departments need resolution in a local environment since overseas technology regimes impose “sanctions” as in the recent past preventing access to developments. Sometimes this is regretted. But this act is perhaps very welcome – it helps indigenous build up of science and technology tools with self-reliance becoming an accepted strategy. The national need and relevance of faculty and scientists thinking about advanced subjects becomes established beyond the attitude of “poor engineering science”.

This is not always true of all fields in engineering. There are some fields like telecommunications, biotechnology in pharmaceuticals that have been entered into by multi-nationals who can afford to and actually bring together excellent scientists to do meaningful frontier research and the question of academics making significant contributions becomes a more difficult aspect – the field becomes locally very competitive and it is not easy to choose outstanding areas to make contributions.

There was an interesting event during the regime of Prof. Padmanaban as the director. Sometime during 1976 – 77, some large scale funding was supposed to come to the Institute specifically to ECE/CEDT aimed at creating a school, it was said. The Director held a discussion meeting on the issues associated with this. During the discussions, the primary aim seems to fluctuate between providing teaching services at high personal remuneration and as yet unidentified research. For the perceptive, it was clear research agenda was low and perhaps, their investment was aimed at using the Institute for low cost teaching or better termed as HRD by paying remuneration high by IISc standards and manageable by industrial standards. I had occasion to voice thoughts I have brought out in the earlier paragraph, but was thought having a negative thinking on the subject. Not wanting to be contained like this, I drafted a long letter on the philosophies of how research at IISc gets influenced by factors outside India including the thoughts above and sent it away to the Director. I know that it reached the divisional chairmen's office and saw its end, I guess!

In either case, the demands on an academic in engineering science are two-fold – scientific contributions of significance at an international level, and technological or scientific supportive contributions at national level. It is possible that these have overlap, but more usually they are distinctive. This is the double demand of excellence that is not usually expected of an academic in science department. Excellence in international science is adequate. There have been new scenarios of even the academic in science department being concerned with spending a part of the time in capitalizing on the basic research. It appears as though this has to be done against the current trend tolerating non-approving looks from colleagues who matter. Thus though the area of consultancy and technology transfer are allowed to happen without any stumbling blocks, there is no active scouting of research work that has the possibility of being commercialized and connecting such work with industrial houses. In this age, industrial houses buy up advanced technologies from overseas and use them for commercial purposes. Sometimes there are hiccups in the process and there opportunities for new work on modeling and offering solutions in a native approach. To be aware of new technology dimensions and capitalize on the new possibilities, it is useful to be in communication with industrial houses at equal par. Such a situation can be generated if enough respect can be created for the academic research – showing the relevance of the thinking to industry. Such a thinking does not seem to have permeated into the academic community till now.

It is important to return to the choice of research/technology problems for pursuit in academic arena. The event of IISc reaching a hundred years nearly coincides with the hundred years, of eventful growth in science and technology, the fruits of which are being savored by the current civilization. Scientific pursuits have answered many questions and areas that were green some time ago remain no longer so. To maintain uniqueness in research ideas requires far greater effort, for somebody somewhere has thought of a similar idea and has already published the work or is on the point of doing it. The only way out of this appears to be exchange of thoughts with faculty presenting their areas of work justifying the

uniqueness. In an environment where a technical criticism from a colleague is usually interpreted as personal criticism, it is necessary to create structure of discussions in which things can be learnt on what one should be attempting to do and what one should definitely avoid. If such debates do not occur, creation of excellence becomes an accident and not a part of design. Surely, it is not possible to promise for oneself a Nobel prize winning work; but excellent work at the frontier is possible. Students should talk about it at the café, at the hostels amongst themselves and others as to how some piece of work going on in a certain laboratory is truly outstanding – in soft whispers to loud debates; the atmosphere will become charged with expectations. Creating such an environment is the demand on the leadership at the Institute. The concept outlined above is called co-creation in management jargon.

A very recent view of businesses across world articulated by Prof. C. K Prahalad*, a management guru now in the USA talks of co-creation as the order of the day for new business model. Co-creation implies involving the consumer in the creation of product of value. What has been articulated here – debates of the choice of problems for study, in a participative mode rather than being left to natural events shaping the career of individuals is somewhat similar. In one case, what is “sold” is a product or a service. In another case, it is scientific work of value.

*see a recent interview at [“It’s now the era of Micro-Innovators”](#), Business today, May 02. 2008