To

Prof. Anurag Kumar
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Prof. Devang Khakhar
Director
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Bombay, Mumbai 400076

17th April 2017

Subject: *Formalization of the Development Agenda within India's Science and Technology establishment.*

Dear Prof. Anurag Kumar and Prof. Devang Khakhar

Both IISc and IITB are two of the most eminent institutions in India and are currently headed by two very eminent and distinguished academicians, scientists and able administrators such as yourselves. The conduct of Science and Technology (S&T) in the country is directly and indirectly influenced by the conduct, the methods, the topics of research and the notions of rigour and soundness that your institutions practice.

Yet all is not well in Indian S&T. We see a great disconnect between the state universities and the centrally funded institutions. Within the older IITs, we see excessive coaching, a diversion of talent away from core sectors, and a dropping quality of PhD applicants. In the Sciences, we see a narrow focus on academic research with little relevance, an over-supply of post-graduates and few openings other than in academics. We also see the newly started IITs and IISERs groping for definition and fighting for the same pool of central funding. The so-called placement problem is acute for these new institutions, specially the IISERs where there are few pathways for gainful employment for students who do not want to pursue a Ph.D.

On the other hand, we also have the development agenda of *sadak, bijli, paani*, and other material needs of a young and impatient population. We see age-old practices of delivery based on outdated knowledge and a governance which is failing. We also have small, household and rural enterprises, who are our largest employers, struggling in the market place.

An important cause is the absence of the above agenda in our curricula, our research agenda and our modes of engagement. We have not recognized these sectors as essentially engineering and scientific services, but which require an inter-disciplinary and field-oriented methodology within a regional context. We have also failed to formalize these sectors so as to bring out the key processes

and problems, ways of measurements, agents and their protocols, in other words, opening them up for analysis and ultimately improving outcomes. If we had done this, perhaps today we would have the necessary empirics to have innovated on new gadgets and processes, and created new job definitions and professions, which bring efficiency and deliver value and actually pay for themselves. Examples of such positions are District Drinking Water Analyst, or District Public Transport Manager, or Cooking Energy Auditor, the City Economist, or even the Scientific Advisor to the District Collector!

I must add that engagement with the development agenda has always been part of the research and training within universities in the West. It was only in 1958 that MIT dismantled the Department of Sanitation Engineering. Or see, for example, the Transportation Center at the University of Toronto or the inter-disciplinary Twente Water Center. Today, various top universities are redefining engineering education, e.g., "Engineering+X" at University of Southern California, Development Engineering at UC Berkeley, the Tata Center at MIT and innovative UG programs at several universities. There is a new focus on engagement, i.e., identifying key stakeholders and establishing direct dialogue with them. Even in colonial times, the Thomson Institute (now IIT Rourkee) was to supply knowledge and engagement to what the colonial administration perceived as its development agenda. It is after independence that we have (i) failed to incorporate the study of basic engineering needs of the common people, and (ii) failed to remain engaged with the state's programs and processes.

My proposal is to initiate the formalization of the development agenda and reclaim it as an area of interest for our broader science and technology establishment. It is to assert that these areas are indeed amenable to scientific rigor, soundness and rational argument in broader society.

This is to be achieved by our network of centrally funded institutions adopting certain key measures. Perhaps, we can begin with the IITs, IISc and the IISERs. The key steps are:

(i) Each department is to identify 2-3 development sectors for deeper engagement and study. For example, Civil Engg. at IIT Bombay may choose Low-Cost Housing, Mechanical Engg. at IIT Mandi may choose pedestrian bridges for the hills and Chemistry at IISER-Pune may choose regional water quality assessment and analysis.

(ii) In these areas, the departments will identify a team of faculty members to develop expertise through field-work, inter-disciplinary training, student-based projects and case-studies and engagement with local and regional agencies. This will be supported by laboratories and testing facilities, technical and coordination staff and faculty leadership. This should eventually lead to key reports and publications which contribute to better practices in the sector.

(iii) Upon maturing, these development sectors should lead to elective courses and course material. These should be extended to regional colleges. This will enable them to participate and contribute into this broader and more effective Science and Technology.

(iv) The collection of institutions will together evolve common frameworks for coordination, liaison and accounting, leadership, academic and institutional mechanisms of working in inter-disciplinary areas. They will also work out common funding, faculty incentives and possibly chair positions to give prestige to the program. They will also evolve a common reporting framework such as a new journal or a dedicated stream in *Current Science* providing an outlet for both national institutions and regional colleges to report progress.

A more detailed proposal is attached herewith. Also attached is a paper which appeared in *Current Science* and which was on engineering and science education. That has some data on placements,

trends in research papers and areas, and other related arguments.

In my opinion, such a program will be widely appreciated both outside and inside higher education, in political, social and intellectual circles and also by our alumni. It will be seen as a positive step to broaden and deepen science and technology and strengthen our role in it, and also to provide jobs in the form of new professions. It will also be welcomed by regional institutions for they will see a role for themselves and an outlet for their creative energies.

Perhaps, it may redefine school-level science as broad enough to incorporate the immediate environment as worthy of study, documentation and analysis. It will cause a deepening of scientific temper which will help our common people negotiate for themselves a better deal in the market and in society. Finally, it will show that modern Science has a method and outcomes not only limited to passing entrance exams or publishing papers.
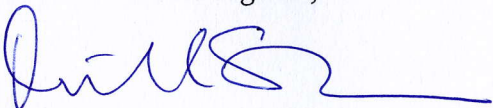
I think IISc. and IITB are well poised for a leadership role in this exciting and challenging mission. Firstly, their own leadership in Indian Science and Engineering will enable the mission to create the institutional space required for others to follow. Moreover, in the form of CTARA and ASTRA, they have the experience and the intellectual capacity to design this mission and to take it to conclusion.

Finally, I must add that the massive dissatisfaction over development outcomes will eventually force us to adopt directly at least some part of the development agenda. It is better that we do this on our own terms and preserve our autonomy and our notion of rigour. After all, the "modern" must ultimately deliver material outcomes for it to be a better system than the "ancient" or the "traditional".

I hope that both of you see merit in this proposal. I would be very happy to present it you separately or together and if needed, assist in preparing the detailed project report (DPR). I would also suggest alumni funding in the initial years to retain our autonomy of rigour and soundness and a focus on outcomes. *I would be happier if I should have no role at all.*

I look forward to hearing from you.

Best wishes and regards,

Milind Sohoni
Professor, CSE and CTARA