Newspaper Clips

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Research and IITs

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RESEARCH at Indian Institutes of Technology (IITs) seems to be suddenly bothering top Indian ministers with Mr Jairam Ramesh and Mr Kapil Sibal choosing to lock horns over it. Mr Ramesh, as an IIT alumnus, can lay claim to knowing the situation at the IITs intimately. He must also be aware that improving the quality of and facilities for research is a long and arduous process but it's not clear why he chose to declare so vehemently that the research conducted at the IITs and Indian Institutes of Management (IIMs) was not up to the mark and that their faculty was far from world-class. Mr Kapil Sibal must be commended for defending the IIT faculty though his response made it clear that he knows precious little about how research is conducted at institutes of higher learning: "Twenty-five per cent of IIT faculties are students of IITs who have done their B Tech (there). Surely such 25 per cent students, who are world-class students, must be world-class faculty." Mr Sibal may be well-meaning but the logic of his statement will escape any bona fide researcher.

There is no doubt that students cracking the joint entrance examination (JEE) for IITs are the very best in the country in their peer group. But, this, however, does not mean that they will do just as well after enrolling at the IITs. There is a real qualitative difference between the kind of knowledge acquired at the secondary-school level and at universities. A sparkling IIT-JEE rank does not necessarily translate into an equally luminous run at the IITs. It is quite possible that someone, who has been unable to crack the IIT-JEE and has acquired his B.Tech elsewhere, turns out to be a better engineer than many IIT graduates.

The build-up to the IIT-JEE involves a lot of focused, gruelling preparation by rote that doesn't encourage satisfying curiosity peculiar to adolescent minds. As such, they may well end up clearing the tough test but without learning how to use their faculties in an imaginative manner. Most students wish to get selected to the IITs with the express purpose of eventually seeking higher education abroad, especially in the USA. Once a student joins a graduate school abroad, he/she gets all opportunities to develop into a top researcher. But by that time, some may unfortunately have lost their ability to think laterally ~ the competitive edge sought by every researcher.

Research requires dedication and genuine interest in the subject matter. It is anyone's guess how many students at the IITs find themselves there out of a genuine love for sciences or technology or, for that matter, driven by a spirit of enquiry. The choice of discipline is often governed by what will be most conducive to gaining a graduate school berth abroad. Such sensibilities do not exactly generate the ability to conduct pioneering research at a later stage.

IITs were envisaged even before Independence with an eye on producing top-quality engineers essential for managing the industrial growth in free India. This idea was a natural corollary to the Soviet model of growth that India was in awe of at that time. When the first IIT was set up in the early 50s, the emphases were clearly on attracting the brightest students of science and have them trained by the best-possible faculty leading to a B.Tech degree. Cutting-edge research was not a priority at the IITs for a long time.

There is an additional difficulty regarding engineering research. Engineering, just as medicine, law and business, is a derivative discipline and not a fundamental one. Traditionally, successful engineers have been innovative designers who used their existing knowledge of science to solve some seemingly-impossible design challenges. Many

famous professors of engineering traditionally came from R&D departments of major corporations and their achievements were judged differently from their colleagues in the fundamental academic disciplines. Patents and creative designs were considered just as important as journal publications. Considering this, low priority for academic research at the IITs in the past is not surprising.

The way IIT, Kharagpur was set up, confirms this. It was hermetically seclude from any major university and there was no serious effort to develop a parallel high-quality programme in basic sciences. As B.Tech degree holders from IITs enjoy exceptional social prestige, a few basic sciences programmes are offered grudgingly at the IITs. This makes interaction between the engineering and science
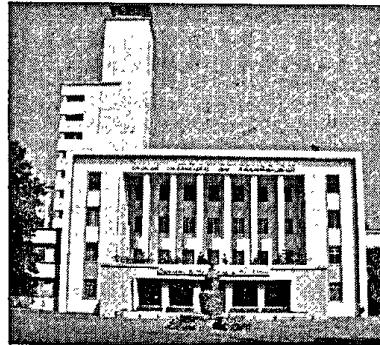
faculties awkward at the IITs and any comparison with the Massachusetts Institute of Technology (MIT) in this regard will be pointless.

After the Second World War, scientists and engineers had started collaborating in real earnest in America and Europe. The war made cooperation essential, culminating in the success of the Manhattan Project. Cold War only intensified the process with the space race lending an added thrust. There was no such organic reason for intense collaboration between engineers and scientists in India. Multidisciplinary research has now become a norm in the West, with even life science and medical researchers collaborating with physical science researchers and engineering experts in a big way to make valuable contributions to biomedical engineering. Our government has belatedly realised this drawback and is now pushing for better collaboration among researchers. But it is not an easy task given the lack of contact between the IITs, top research institutes and universities for such a long time. Once the dividing lines are blurred, quality of research at the IITs can improve dramatically.

PhD candidates and graduate students at major US universities are often required to teach engineering undergraduates. This takes a lot of burden, mostly administrative, off the faculty there. Often, the faculty uses funds from research grants to buy off teaching load freeing them up for research. It is also relatively easy for engineering faculty to obtain grants from diverse government agencies, most notably the US department of defense. Research grants from the industrial sector too has increased considerably over the past few decades. This enables the engineering departments of most US universities to employ many Ph.D candidates and post-doctoral fellows. It gives a huge impetus to engineering research in that country.

The situation in the IITs is just the opposite. The facul-

ty has to devote inordinate time and energy to undergraduate teaching. Twenty contact hours per week are not uncommon in many situations and the teaching load is often more overwhelming than in general degree colleges in India! Research grants are nugatory in comparison with universities in the West. Worse still is the chances of obtaining suitable PhD candidates for the few available positions. Practically all IIT graduates with a B.Tech leave for the USA and the rest are absorbed by the information technology sector. Some even change careers after a stint at the IIMs. This opens the door for graduates of other engineering colleges for M.Tech programmes at the IITs. The European universities have identified such M.Tech pass-outs from IITs as potential PhD candidates, leaving the IITs with very little possibility of attracting good PhD candidates. No wonder, this affects research activities at the IITs.

Improving quality of research at the IITs needs a multi-faceted approach and collaboration with other high-profile research universities and institutes in India. The lure of the USA has given the IITs such a haloed status that some basic facts about quality research have been overlooked. Quality research in every discipline is equally difficult and all researchers in all disciplines must have respect for each other. Specifically, scientists and engineers must interact and exchange ideas freely. BTech graduates should be able to do research in a field of pure science if not lacking in relevant academic background and motivation. Similarly, bright students of sciences may be accepted as PhD candidates in an engineering discipline related to his/her specialisation and interest. In a country which acutely suffers from brain drain, compartmentalised padagogy is not an option ~ all available talent must be harnessed. The Indian industrial sector can act as a link between science and engineering researchers. Perhaps, the HRD ministry could take a cue from the research framework programmes devised in the European Union.

At the time of inaugurating new IITs, the government must make efforts to introduce programmes in basic sciences with as much urgency and dedication that it reserves for engineering disciplines. Such as setting may also be ideal for developing courses exploring the philosophy of science and/or engineering to cultivate a culture of scholarship. In the West, some highly-motivated students work towards an MTech (MSc) or PhD in this area after obtaining a BTech. Their inter-disciplinary command is highly appreciated in the job market. With India experiencing a resolute growth, our students should slowly be able to look beyond qualifying for a mere livelihood and experiment with unconventional career paths. Finally, PhD candidates must be given more facilities to make research an attractive option for them. And, this shouldn't be restricted to higher pay alone. The researchers must have the best of equipment and a closer collaboration with industry (which could easily extend to job offers after graduating) other than funds and facilities to attend conferences regularly in India and abroad in order to routinely engage with peers and experts. Finally, Indian media must stop eulogising IIT graduates who end up moving abroad or high salaries commanded by graduates of the country's top management institutes. This unwavering fixation with upward mobility is a uniquely post-reforms Indian phenomenon which could and does have a devastating effect on the quality of research at the IITs.

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'The machine understands what you are searching for'

Prof Kurt Mehlhorn, founding director of the Max Planck Institute for Computer Sciences at Saarbrucken, Germany, talks about cutting-edge research projects with Indian researchers through the German Academic Exchange Service (DAAD). He spoke to Narayani Ganesh:

■ **What is the vision of the Max Planck Institute for Computer Sciences?**

Our vision is to be the leading institution in algorithms and have impact beyond computer sciences. To this end, our curatory board includes industry participants like Siemens, Bosch, Google and others. We have established IMPECS, the Indo Max Planck Centre for Computer Sciences with IIT, Delhi towards enriching research with international collaboration. We have 10 research groups with IITs, Indian Institute of Science, TIFR and others. The budget to carry out collaborative research is four million euros for five years, with 50% contribution from India's department of science and technology.

■ **What do you mean by "impact beyond computer sciences"?**

In the field of computational biology, for instance, software has been developed that shows great promise in HIV-AIDS therapy. The programme titled Geno2Pheno contains a DNA database of several strains of the virus from feedback given by doctors – since the virus changes very quickly. It suggests treatment taking into account the fact that the virus is likely to change. It has been so successful that two-thirds of HIV-AIDS patients in Germany are being treated with the help of this system. This, for instance, is having impact beyond computer sciences. The pro-

Q&A

gramme is on a Web server and is available to all. Thomas Lengauer, who wrote the programme, is also working on a flu project.

■ **What is the YAGO project?**

Developed by researcher Gerhard Weikum and his team, the YAGO project is a knowledge base consisting of 80 million facts per person, at the rate of collecting 3,000 facts per day over the lifespan of an individual with an accuracy of 95%. The programme is being used in several academic and industry projects including IBM's Watson project. The highlight of the programme is replacing keyword search with semantic search – that is, the machine "understands" what you are searching for so that it can look for it and also interpret the idea. Currently the semantic search programme is being applied only to Wikipedia.

An unusual project is the one on software that captures motion. It records internal movement of a human in action and with the help of a database of human body types, size and shape, it is possible to, for example, replace the thin body of a man in motion with that of a more muscular or filled-out body while keeping the integrity of the background intact.

■ **Photoshop in video movement? That might be useful in movies.**

Yes, we're not yet clear about its applications. Arjun Jain, a student from Bangalore is currently working on the project with a team. They've filed for a patent.

■ **How has the institute's work helped researchers navigate the information glut so typical of data collection?**

We developed LEDA, the Library of Efficient Data types and Algorithms. When Celera, the private organisation, ventured to decipher the human genome, it built its software on top of our software to help the end-user.

We have also done other interesting projects like the Mercedes-Benz five years ago where we computed the size of a trunk in the early stages of development of á vehicle, to reflect its storage capacity in volume in terms of solid matter. How many standard bricks can you place in the trunk? Even a small increase in the computed capacity would contribute to increase in car sales!

MMRDA to install noise barriers

Our Bureau
Mumbai, July 12

The Mumbai Metropolitan Region Development Authority will install noise barriers near the IIT Campus, Mumbai.

It has invited contractors who have carried out installation of sound absorbing equipment to submit bids for the work as per the criterion specified in the tender notice.

"IIT-Bombay is one of the top educational institutes in the country and providing it with a quieter surrounding should only be a welcome step," said Mr Dilip Kawathkar, Joint Project Director (PR), MMRDA.

Mr Kawathkar said the authority had installed such barriers at the Bandra-Kurla Complex, which helped bringing down the decibel levels from 98 to acceptable limits of 55 decibels during the daytime and well below 45 decibels during night.