

## How IISc can contribute to society?

Narayana Murthy was piqued by the little contribution of the Indian Institute of Science (IISc) to the society at its convocation in July last. He did not try to elaborate on it though. I do not know whether he wanted to provoke the Institute by this statement. Many in the scientific community demure that this is true and should be debated further. Rao<sup>1</sup> has ascribed this to the paucity of funds allocated to the institute and the apathy of the industry in funding IISc. He did not give reason for this apathy. It is true that IISc (and similar institutions) has produced excellent scientists and engineers who have contributed significantly to the development of the country. Still the question is, is that all one expects from IISc or is there something more that IISc could have done? Should the faculty (or others) be blamed for the present state of affairs? If we review the present educational system and the relevance of research (both basic and applied) in the country, we should be able to understand the malady and the cure. As an individual who got his Ph D from IISc, worked in both IISc and in industry on projects in developing technology relevant to the country, I wish to bring to perspective the contribution of Indian industry to the present state of institutional R&D in the country and how Narayana Murthy's criticism is out of place.

The main objective of J. N. Tata in establishing the IISc was to have a world class science and technology institution which would help develop Indian industry. From the early days of industrial development in the country, however, industries with a few exceptions have depended on imported technologies (however old or bad they might have been) from the developed countries. The government of the day had also been protecting such industries by levying high import duties, so that local industries could make good profit with whatever quality goods they produce and sell at whatever prices they want. Local competition was simply not there at all, as the Government would not license new establishments and encourage competition. Thus, there was no need for the industry to improve technology or products by R&D in its manufacturing activities. There was no attempt to do reverse engineering or understanding how the plant

and equipment were designed and fabricated, so that when expansions were done, the equipment could be designed and made locally. Whenever a need for improvement was felt, original technology provider was approached for help. Even today with the open economy, low import duties and local competition, the same trend continues. If local manufacturers are not able to compete with foreign companies, they simply import such goods, put their name and sell in the local market and still make good money. Thus, there has been no necessity or impetus for development of any indigenous technology. It is known that 'necessity is the mother of invention'. As far as manning of the factories, since the technology provider would have given operating procedures, specifications, drawings, spares, maintenance schedules and even QC and testing procedures, factories employ only workmen like operators, fitters or electricians for routine operation and maintenance and supervisors (who would at most be graduates or diploma holders) to take care of shift work and allot work to workers who man the operations in the shifts. If some engineers are employed, they are expected to have the ability to communicate with the original technology provider on the plant operation and problems being faced by the factory for which solutions are provided by the technology provider. Thus, there is absolutely no scope for well qualified engineers, let alone Ph Ds in a factory. Indeed most of the engineers and Ph Ds from IISc and other institutions seek employment in some government laboratory or university, or go abroad for masters or post-doctoral work and then settle in that country.

Thus industry needs no scientists or engineers. On the other hand it needs good people for managing the business. For the industry, purchasing, marketing and sales are the most important departments, other than finance and management. For such jobs, talented people are needed. Who else other than the IIT graduates fit these jobs? They are the cream of the country and get a fat salary if they join industries! In any case, their technical education is not really of value to the Industry. This is also the reason why students of IIMs and other management institutions are in great demand in

the country. Thus, we have a queer situation where intelligent people who are trained in the best technical institutions join industry for doing commercial jobs. There is no manufacturing activity worth the name developed locally in any field including defence manufacturing. Even the present government policy of 'Make in India', also appears to encourage foreign companies to establish manufacturing activities in the country with their own technologies and funds.

Only those technologies which were denied to the country like nuclear and space were developed locally and have demonstrated to the world what India is capable of. It is pertinent to note here that IISc has played pivotal role in these areas. As far as other areas are concerned, IISc or for that matter, the many CSIR Laboratories which were established to develop technologies and to serve the industry have been able to contribute very little. Still, I wish to recall a few technologies that IISc developed when I was in IISc between 1972 and 1977. I particularly refer to the saga in developing local know-how for making silicon for which technology was being denied to the country. Details of this saga can be seen in ref. 2. The technology was successfully transferred to industry. The fledgling unit struggled hard to reduce costs, improve yields and quality by locally procuring spares and consumables and recycling many critical inputs. For nearly a decade and half, this small unit was supplying silicon wafers to BEL, BHEL, CEL and other PV silicon solar cell manufacturers in the country. This unit could have grown to be a world-class hub and would perhaps have been a successful achievement for IISc. However, it was closed because of management apathy. Today, not a gram of silicon is being made in the country. There is tremendous growth of solar PV and Giga-watt level capacities being built in the country, but all with Chinese made solar modules and German inverters.

When I was in IISc, Vasudeva Murthy's group was also involved in developing other technologies like growing garnets, synthetic quartz crystals and elemental fluorine. Another group did considerable work on solid propellants for the space department. A. K. N. Reddy did considerable work for the betterment of rural

people by many innovations. Srinivasa Murthy of the Civil Department developed a technology for making underpasses with low cost and without disturbing the traffic. He demonstrated this at several places in Bengaluru. (However, this was not used because the local contractors found that this was not a money spinner for them!) Thus in the few years I spent in IISc, I know it was contributing for the good of the country. Perhaps, the Director of IISc could ask all Departments to list out all such works and prepare a report. Such a compilation might provide an answer to Narayana Murthy's questioning IISc's contribution to the society.

Research and technology development demands passion, deep involvement, dedication, sacrifice and perseverance. This is not the end in itself and should be successfully commercialized by the industry. This has been the greatest problem in our country. Academia and industry are in water-tight compartment and do not interact. Academic institutions work with the only aim of producing research papers, so that students get their degrees and the professors get their list of publications boosted, which is important for their careers. In fact many professors refuse to take up work on solving industrial problems because such work will not lead to publications. Industries in turn also do not approach the academic institutions as they feel that such institutions lack knowledge of what the industries need. The situation in the USA and Europe is very different. There industries work closely with universities. In fact there is regular migration of people from industry to academic institutions and vice-versa. They are aware that for industries to be in the forefront of technology, research work is very important. They spend a good part of their earnings on R&D. In addition, they fund

reputed institutions to carry out advanced research related to the industry. No wonder such institutions are in the forefront of technology development.

The above narration is pertaining to the manufacturing sector and should make all stake holders in the country understand why educational and research institutions are what they are. There are not many academicians who like Vasudeva Murthy are interested in applied research. Similarly, there are not many industries which do in-house development to improve their technology and process so as to beat competition. They are also not interested in approaching academic institutions to help them rather than seeking foreign collaborations and technology. This is not good for the country as a whole. The government should curb the tendency of well-established industry to seek foreign technology and ask them to develop their own capabilities for being competitive. For such purposes, they should be encouraged to seek help from academic institutions. In fact, this is happening in China now. After mastering the technologies obtained from USA and Europe, China started making improvements on such technologies, so much so, that it could produce materials at much lower costs and better efficiencies than the technology providers themselves. This is the reason why today China has become the manufacturing hub of the whole world. The emphasis that China is giving on developmental work can be seen from the increased number of international patents that the Chinese are filing. The role of the Chinese Universities has been significant in this. Because of the aggressive stance of the Chinese authorities, the universities are required to get associated with industries, study their processes and problems and come out with appropriate solutions. Equally important has been the

fact that most of the Chinese students who go for higher studies to the USA and Europe return to their country and participate in its development. This is in stark contrast to Indian students who after completing their studies stick on to jobs there and never return. We may take pride in the large number of Indians in US Universities, Laboratories and Industries. But alas, they make no contributions to our country's progress. Academics should be asked to get funding from industry and take up time bound work and deliver tangible results. Only then institutions like IISc will change their working culture and contribute to the good of the nation. Industrialists like Narayana Murthy on their part should fund Indian Universities to carry out state-of-the-art research which would help the two to grow together. We should also strengthen our IP Regime. I find that today our Patent office takes 3 years to just acknowledge the receipt of a filing. I wonder how many years it takes to get a patent.

It is pertinent to mention here that the IT industry in the country has not made any original innovations. It is making money merrily, thanks to the availability of a large pool of cheap labour and high disparity in the exchange rate of Indian Rupee against currencies like the US Dollar and Euro. So should we say the remark of Narayana Murthy is like the kettle calling the pot black?

1. Rao, C. N. R., *Curr. Sci.*, 2015, **109**(5), 844.
2. Murthy, H. S. G. K., *Curr. Sci.*, 2014, **107**(1), 129–135; <http://www.current-science.ac.in/Volumes/107/01/0129.pdf>

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## Teaching science of biosecurity at schools

Biosecurity is a shared responsibility. As biodiversity resource managers, humans play an indispensable role in its implementation. In principle, bristle-appendaged lemma of grasses can get dispersed through globetrotters via footwear treaded

relocation, e.g. from Alborz Hills in Iran to Ponmudi Hills in India. Likewise, Dead Sea marine fouling forms can be introduced into Pulicat Lake through our Israel-bound travellers, reaching back home with the same unwashed dive-gear in use.

School children must be illustratively enlightened on bioinvasive pathways through metaphorical posters on various themes, viz. handling and disposal of air-freight courier packaging materials; air-dashed inflow of cockles, scallops,