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And thus waits the cat

In reference to the many articles appearing in *Current Science* as well as in other journals on the subject of Science and Technology in India, I would like to comment on three major points. (i) scientific temper and culture, (ii) infrastructural facilities, and (iii) who should take initiative to achieve (i) and (ii)?

I have quite often taken a fancy to liken the conditions of road traffic on a typical main road in a typical Indian city with the Indian attitude in general and in particular with the state of affairs in the world of science in India. Look at the traffic on a road. Firstly, the road is bad, sometimes almost unfit to be used for any vehicular traffic. There are ups and downs, holes, pot-holes and man-holes. There are no traffic lanes. There are a diverse variety of vehicles and objects moving with varying speeds. Watch them carefully—each one has only one aim—to proceed further, to go ahead at any cost irrespective of the speed that can be attained by a given vehicle. Each one wants to pass the other and forge ahead. If we think that there is an inbuilt olympian determination behind all this—we are completely mistaken. There is an inexplicable nonchalance in any given individual, driving any kind of vehicle in doing what he is doing! One has to move ahead and he shall do so by whatever means and through whatever space that can be spotted and from whatever side of the vehicle that is ahead. One is not at all aware how many traffic rules he is violating and how many stop signs (if they exist) are being ignored. However, there is only one incident at which everyone becomes aware that something had gone wrong—an accident.

To me, the condition in science practice (perhaps in other professions too) in India is very much analogous to

the road traffic and the situation, in a simplistic way, can be taken as an example for utter lack of scientific temper. Having said that, scientific temper would be, then a situation just opposite of the chaotic scene described. The roads should be good, must have clear cut lanes for traffic in opposite directions (this is akin to creating good basic infrastructure for scientific research). Passing will be done only from the right side after watching the traffic from the other direction and all the rules and traffic lights will be obeyed. In other words, traffic will have to move in a systematic manner and one would realize, if that is only done, how smooth and efficient the movement of traffic would be. The scientific research activity in India needs a similar change. The problem is more of a mental dimension than that of any other. A young person who chooses science as his/her career must do so only because of his innate fascination to seek truth about the ways of nature. The needed determination and commitment must be demonstrated by the candidate bidding to become a scientist. The truth-seeking path is a strenuous one and demands resilience as well as of certain ethical and moral standards. It is therefore, implicit and also imperative that the nation's scientific community should have a significant proportion of its existing members possessing the above qualities so as to perpetuate this scientific temper and culture through generations to come.

The second point of my discussion relates to the need to ensure the existence of certain basic infrastructural facilities for conducting scientific and technological research. At least in biological sciences, I can say with confidence that gone are the days when meaningful discoveries can be made through devotion, commitment and hard work alone! A stage has come that

a minimum set of gadgets are needed along with the above qualities if one has to achieve anything at international standards. That being the position, we are at a primitive stage of struggling to ensure an uninterrupted supply of basic things like water and electricity. The conditions in any given university, a place where the scientists are in the making, are nothing but deplorable. Quality science can never emerge out of weak and flimsy basic foundation. The massive programme of biotechnology launched in the country is an apt example for trying to construct super structures on weak foundation.

My third point, perhaps the most important one, is how to achieve the above? Who should take the initiative? Undoubtedly, the Indian science has patches of brilliance and commitment. Indeed, it is these committed and brilliant people that are somewhat sustaining the Indian science. However, these top scientists themselves seem to be in a state of confusion since they are faced with two major tasks (i) to work hard to stay where they are and (ii) to see what kind of role they can play to save and promote Indian science. Frankly, it is time that all top scientists of the country indulge themselves in introspection to examine how objective they had been in judging others. How much time has been spent in the actual exercise of assessing, selecting and promoting the interests of peers and younger scientists? What has been their contribution to induce confidence in younger scientists that they will be judged unbiased and real commitment would receive its reward? It is also of basic importance to have a fresh look at the encouragement universities are receiving although those are the places from where all the future scientists are manufactured. It thus appears that it is relatively easy to identify what is wrong

with Indian science. Also easy is to give suggestions as to what should be done. However, it seems very difficult to identify who should do it. I dare say that the top and more fortunate scientists themselves should take the initiative. The cat is there and the bell is there. Someone has to bell the cat. If necessary, by taking exemplary and brave steps.

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Basic science

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All of us, members of the scientific community are very much concerned with the declining support for R&D in the country. In the case of R&D in basic sciences, it will be still harder because it cannot be linked directly to production or profits of the industry. Probably it may be worthwhile to emphasize the emergence of scientific temper and the outlook to look rationally at the problems of the community as an outcome of the R&D in basic sciences. In engineering sciences, it is time to put more effort on the linkages for utilization of the R&D output for higher productivity and competitiveness at international level. It seems that the public awareness of these advantages is not to the level that it should be. If the academies in the country and the other institutions/societies of engineers and scientists could form a common platform and organize in a structured way efforts to create awareness in the public and politicians, this could probably help better impact leading to greater appreciation of the R&D efforts.

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I fully share the concern regarding lack of adequate incentives and investment for R&D work in the country. The industry which is a major beneficiary, contributes very little for the purpose.

Although the Government has been funding R&D projects in a substantial way, the impact is yet to be felt. In the circumstances, the recommendation that a fillip needs to be given for R&D in our country merits consideration if it has to compete globally. You may be aware that IDBI is operating Venture Capital Fund (VCF) Scheme with an objective to promote indigenous technology leading to commercial applications. Under the scheme 70 proposals have been sanctioned assistance. Much still needs to be done in this area.

It may be mentioned that recognizing the capabilities of Indian scientists, the Finance Minister, in his budget speech for 1993-94, felt the need to encourage Indian industry to spend more on research and development by using the facilities offered by national laboratories and research institutions. For this purpose, he has proposed a weighted deduction of 125 per cent of the contribution out of income from business or profession for research programmes in approved national laboratories and institutions carrying out research and development in natural and applied sciences. I am sure, that this is a step in the right direction for encouraging R&D in the approved national laboratories/institutions by sponsoring through industries and commercializing the same.

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The resource crunch in Government has inevitably meant that some belt tightening is called for from all sides. We have attempted to insulate key Departments such as those relating to Science and Technology to the extent it has been possible. The Prime Minister has also taken a meeting to review the budget of the Science & Technology departments with a view to ensuring that critical areas do not suffer from lack of funding. Government will continue to play a primary role in this regard. However, as has been the experience in many other countries, industry should also come forward for financing R&D as they would be the eventual beneficiaries.

We have also taken note of changes

taking place in the internal and external economic environment which have given rise to an urgent need for integration of the activities of scientific agencies with the programmes of various Ministries, educational institutions and industry. To meet these needs certain changes are being made in the Apex level bodies that address these issues including at the Cabinet level. We hope that these measures would enable us to give a concerted thrust to S&T activities in India.

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Delhi—the R&D capital of India

More than half of the 522 Central Government-run Research & Development institutions including Public Sector Undertakings (PSUs) are located in just nine cities of the country and only a few of them are situated in the mofussil areas.

The analysis is based on the latest information-friendly document *Directory of R&D Institutions* of the Department of Science & Technology¹, which reveals that Delhi with 87 institutions tops the list followed by Calcutta (43), Bombay (39), Bangalore (33), Hyderabad (30), Madras (18), Pune (14), Dehradun (12) and Lucknow (11). These altogether account for 54.98% (287/522) of the Central Government-run R&D institutions in our country.

Another 66 (12.64%) R&D outfits are distributed in 11 cities. These are Ranchi (8); 7 each in Chandigarh and Nagpur; 6 each in Ahmedabad, Bhubaneswar, Kochi and Thiruvananthapuram; and five each in Allahabad, Bhopal, Dhanbad and Kanpur.

And the rest 169—almost one-thirds (32.38%)—are located elsewhere in different states excepting Manipur and Tripura.

Barring a couple of major science & technology agencies (including PSUs), the headquarters of most of these organizations, as expected, are located in Delhi.