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**Frontline**

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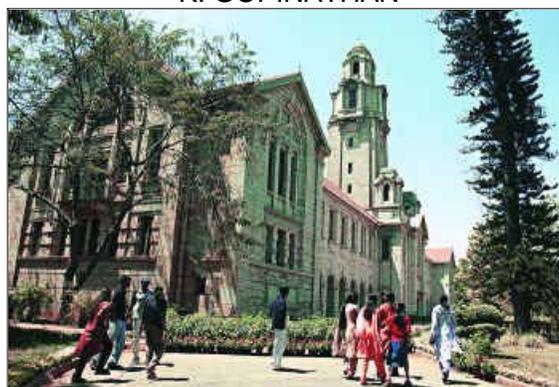
## ISSUES IN FOCUS

### Whither science research?

R. RAMACHANDRAN  
*in New Delhi*

**Basic science research in India is on the decline. The need of the hour is drastic academic and administrative reform that can boost human resource quality, and not just increased funding.**

K. GOPINATHAN



**On the campus of the Indian Institute of Science in Bangalore.**

A NEW way of funding and doing research in the basic sciences seems to have been found by the country's policymakers, which can be described in a word: arbitrariness. The recommendation of the recently constituted Science Advisory Council to the Prime Minister (SAC-PM), headed by C.N.R. Rao, to establish a National Science and Engineering Research Foundation (NSERF) as an autonomous body to fund basic research with an annual funding budget of Rs.1,000 crores, exemplifies this best. The creation of the NSERF is one of the first sets of recommendations that the SAC-PM made to Prime Minister Manmohan Singh on March 3 and is reported to have got his "in-principle approval".

The idea of a foundation for research, on the lines of the National Science Foundation (NSF) of the United States, has been aired every now and then. Most notably, an editorial in *Current Science* in 2000 argued for the creation of such a body. Also the new Science and Technology Policy of 2003 (STP-2003) had called for a new funding

mechanism for research. In this context, some scientists reiterated the foundation idea (*Frontline*, June 18, 2004). According to V.S. Ramamurthy, Secretary of the Department of Science and Technology (DST), the Tenth Plan document of the Ministry of Science and Technology has already mentioned this. "In fact, we have been talking of this for the last 15 years," Ramamurthy said.

And yet, there is no detailed document or a white paper spelling out the proposed foundation's objectives, structure, funding mechanism and the elements of the NSF (or a similar body elsewhere) that the Indian foundation could adopt. The subject has never been discussed or debated in any of the academy meetings or other scientific fora. There may well be a case for an autonomous funding body but that argument is yet to be made in concrete terms for any debate to take place. All that exists, besides the editorial of 2000, is a four-page 'concept note' presented to the Prime Minister on March 3, which is hardly convincing.

"The key element," the note said, "would be its status as an autonomous body, charged with the mandate of raising the level of scientific activity in India to internationally competitive levels. There is an urgent need to recognise that basic research output is stagnating or on the decline and that a concerted effort by a new body (with an annual funding of Rs.1,000 crores) may be necessary to reverse the process."

So where does the figure of Rs.1,000 crores (not a small amount) come from? "Simply out of the hat. In fact, out of the many hats that some of our top policymaking scientists wear," quips a science-bureaucrat of an important agency that funds research. The *Current Science* editorial had argued for a Rs.100 crores - Rs.200 crores annual budget for this *additional* channel of funding basic research. Two years down the line, the Plan document apparently placed the figure at Rs.500 crores. This has now become Rs.1,000 crores. "The funding under the SERC [Science and Engineering Research Council] scheme [f the DST] at present is about Rs.300 crores. So we proposed roughly three times that amount. There is no hard document for that," says Ramamurthy, a member of the SAC-PM.

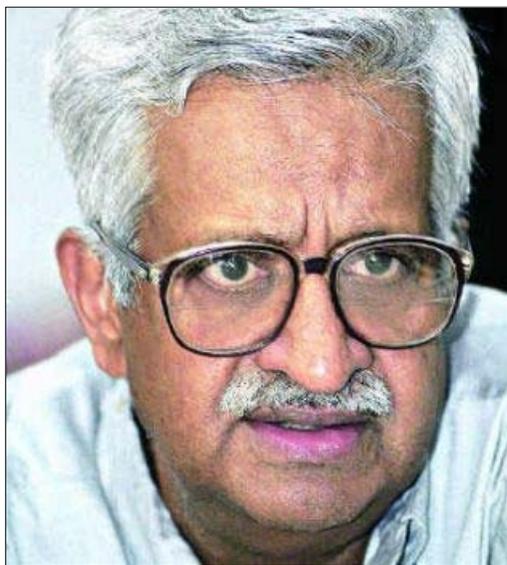
This is as arbitrary as the largesse of Rs.100 crores for the Indian Institute of Science (IISc), Bangalore, announced by Finance Minister P. Chidambaram to enable IISc to become a *world-class university* on a par with Harvard University or Stanford University or the Massachusetts Institute of Technology or Cambridge University, as if money alone could ensure that. And equally arbitrary is the allocation of Rs.200 crores in the 2005-06 Budget for Nanoscience and Technology Initiative (NSTI).

It must, however, be pointed out that while the allocation for the NSTI is an earmarked figure under a new budgetary head for the DST, there is no head for the proposed budgetary grant to the IISc under

the Ministry of Human Resource Development.

A corpus fund of Rs.150 crores, which was announced in the 2000-01 Budget, following the Mashelkar Committee's recommendation for drug research and development, was allocated only last year. In the case of the IISc, there was not even a recommendation or a request from the Institute or the Ministry. Indeed, even the Director of the Institute was surprised at the announcement.

The NSERF proposal is at present only a recommendation of an advisory body. It has to go through the due process of approval and sanction, the Prime Minister's in-principle approval notwithstanding. It is learnt that a note for approval by the Cabinet is under preparation. If approved, the matter has to go to the Planning Commission for clearance and then to the Finance Ministry, which will have to find the requisite money. Since the proposal involves the creation of an entirely new entity a law will have to be passed by Parliament before any action can be taken. So, the realisation of the concept is at least a couple of years away, by which time even the Tenth Plan period may end. Nevertheless, the proposal merits discussion.



**Prof. V.S. Ramamurthy, Secretary, Department of Science and Technology.**

Under the existing dispensation, the largest funding for basic research is disbursed by the SERC, a programme established in 1974 under the DST. The SERC has been greatly responsible for the spurt in research funding in the 1980s and it maintained a steady growth through the 1990s. In fact, the SERC allocation got a major hike in the 2002-3 Budget and the current figure is about Rs.300 crores. Besides the SERC, the other large funding bodies are the Department of Biotechnology (DBT), the Board for Research in Nuclear Sciences (BRNS) of the Department of Atomic Energy (DAE), the Indian Council of Medical Research (ICMR) and the Defence Research and Development Organisation (DRDO).

At present, the total funding for extra-mural research - defined as R&D projects outside the institutions and programmes of the respective Departments and Ministries - would be about Rs.600 crores. Of this, basic research accounts for about three-fourths. That is, besides the SERC's Rs.300 crores, about half the amount is available from other agencies. This is an indicator of the capacity for fund absorption in basic research by academic institutions and universities. What the new proposal is seeking is more than double this amount. In fact, the `concept note' makes it clear that this amount will not replace the existing funding mechanisms; it will supplement them. So one is actually talking of an annual funding of basic research in academic institutions and universities to the tune of Rs.1,500 crores. But is there a demand for such an enhanced amount?

"We have to create this demand by initiating new areas of research," says Ramamurthy. "If the scientists know that money is available, major research proposals will come," he adds. But an insider of a key funding agency said: "Money has never been an issue. The problem is we just don't get good proposals even for the money we have. There are just no good research ideas." According to Ayyagiri Rao, a DST adviser who is in charge of administering the SERC, there has never been a case of a proposal being rejected or sub-optimally funded for lack of money.

He also counters the argument that funding levels have not kept pace with increasing costs of doing research in such things as consumables. "We fund according to the breakdown of expenses stated in the proposal. And if there is an escalation of costs, there is provision to enhance the funding, even for consumables, if a proper case is made," he said. "Money has always been found whenever the need is legitimate," S.B. Krishnan, a former Financial Adviser in the DST, points out.

The other rationale for a funding body outside the Ministry, according to the `concept note', is that the mechanism for funding has become "mired in bureaucracy with complex financial procedures inhibiting efficient operation". The average time, point out scientists, for approval and the beginning of money flow is one to one-and-a-half years, which is unacceptable. "A foundation that manages its own accounts and is run by scientists is the only way to reverse the rapid decline in Indian science," the SAC-PM Chairman has observed. The concept note also recalls the statement about "debureaucratization" made in the STP-2003 and its reiteration by the Prime Minister at the Indian Science Congress at Ahmedabad in January.

MONEY reaches the principal investigator of any SERC project after four stages: the peer review process by the Programme Advisory Committees (PACs), which are composed essentially of working scientists; technical approval by the SERC; financial sanction by the Financial Adviser and disbursement of the fund to the scientist through the

respective institution/university channel. According to Ayyagiri Rao, the first two stages together take typically about eight to nine months because of the detailed peer review process involved, which includes a presentation by the scientist to the PAC. "The time we take for this part is about the same as the NSF takes. I can do away with the peer review and bring down the processing time like some agencies with smaller funds do," he said. It needs to be emphasised here that the peers who would be reviewing proposals in a foundation are going to be drawn from the same set of specialists in the Indian scientific community and would roughly take the same amount of time.

"Financial sanction could take some time because of the government procedures involved but that is usually a formality once the PAC and the SERC clear it, though there could be room for marginal improvement here," Ayyagiri Rao said. In the DST, in fact, the process of financial approval is simpler because the Secretary is the Chairman of the SERC as well. Questions are raised by the Financial Adviser occasionally, when there are seeming incongruities, such as a chemist seeking a huge grant for research in genomics, point out department officials in charge of finance.

"As a publicly funded body, even a foundation has to have financial controls of the government system, including an audit. There is no getting away from that," Krishnan says. "There is no provision for a stand-alone empowered institution to receive funds, execute and be accountable on a norm defined by itself or evolved through a consultative mechanism," points out Y.S. Rajan, a former adviser to the Indian Space Research Organisation and the DST. "Autonomy is all right if it results in the delegation of powers to executives at various levels but that is rarely the case," Krishnan says.

"The locus of delay today lies in the entrenched bureaucratic systems within institutions and universities. Reforms are needed at the institutional level but there is hardly any evidence of that. Even the IISc is guilty of that," says a senior bureaucrat associated with a major funding agency. There have been instances even within the IISc when the principal investigator was not even informed of money disbursement for as long as eight weeks, he points out. "The fund receiving institution or university should have its own mechanism of empowering the principal investigator, which does not happen. The powers are all vested in the Registrar or the Vice-Chancellor in the case of a university or with the laboratory director or administrative/financial head in the case of institutions," Rajan pointed out.

VINO JOHN



**Prof C.N.R. Rao, Head of the Science Advisory Council to the Prime Minister.**

"I welcome autonomy but all through the system, right from the fund receiving and disbursing body down to the implementing scientist, the past viruses of control and micromanagement procedures have to be changed; they should be made clear to the public accountability arms of the government. These have often been exploited to perpetrate cronyism and power centres. Autonomy should not be taken to mean escape from accountability," Rajan points out.

Indeed, the submission of the mandatory utilisation certificates annually (which actually is very simple) has been a thorny issue between the SERC and most scientists. There have been cases, even in top institutions such as IISc, of certificates not having been submitted for the entire project period, SERC officials point out. In fact, some agencies require a consolidated utilisation certificate for an institution as a whole and not at the individual project level. There has been reluctance to submit even that. "You might want to replicate the NSF but what we ask for is nothing compared to the kind of extensive documentation and performance reports that a U.S. funding body demands," says an agency scientist. Apparently there have been instances of officials of the U.S. General Accounting Office (GAO) having landed in the Indian laboratory to monitor the progress of a project funded by a U.S. agency.

There are things to be said in favour of an autonomous funding body. Only such a body, as a foundation or as a society, can accept funds from private sources. Of course, in the Indian context, one does not expect private funding for basic research to pour in. Also, existing mechanisms for driving research in frontier areas, such as the Thrust Area Programme of the DST, may have outlived their utility and, one could argue that an autonomous entity may enable such programmes to be initiated proactively. But the track record of the proactively initiated multi-agency National Superconductivity Programme (NSP) during 1987-1996, funded independently and managed by scientists, does not instil much confidence. Even if an autonomous research

funding body can be justified, the level of funding that has been recommended lacks justification.

Indeed, an editorial in *Current Science* in 2002, titled 'Science in India: Signs of Stagnation' - the very issue that the proposed foundation seeks to address - stated: "Ironically, the decline of scientific productivity coincides with enhanced inputs into scientific research (during the 1980s and 1990s)... One possibility is that the universities, which used to contribute substantially to published output, have been declining alarmingly. While many new, and sometimes embarrassingly well-endowed, national institutions have been created since the mid-1970s, the academic science departments in most universities have been rapidly plunging downhill." Post-doctoral research is the stage for fresh research ideas. Unfortunately, observers point out that even in institutions such as the IISc there is decline in the quality of post-doctoral research scholars, a direct consequence of the declining quality among university doctoral students.

So it is well recognised that the issue is not money but the declining human resource quality. And yet, even as the SAC-PM moots an annual research fund of Rs.1,000 crores, nothing has been said about how this money is going to leverage creation of quality researchers. *On the contrary, the SAC-PM has advocated the creation of two new institutions to be called the National Institute of Science, in Kolkata and Pune.*

The root cause of the problem lies elsewhere. Not only is there declining interest in science among entry-level students, but there is lack of quality faculty as well, the so-called 'missing generation'. The problem requires drastic academic and administrative reforms that call for vision and innovative ideas in the corridors of the HRD Ministry and the University Grants Commission, which are sadly lacking.

The Rs.100 crores announced by the Finance Minister for the IISc also defies logic. This one-time grant cannot really achieve what he desires. The IISc can at best buy some expensive equipment or build some laboratories and other infrastructure with the money. As an the IISc scientist put it: "If money could get you a Harvard or Princeton, Dubai and Saudi Arabia would have a proliferation of such universities. What is needed are people." Indeed, if not already, at least a few years down the line, even the IISc would face shortage of quality students and faculty. Chidambaram would have done better by giving it to some select universities.

Indeed, even the sum of Rs.1,000 crores, proposed for the NSERF, could be better utilised by channelising it into the universities well known for science in the 1950s and 1960s, such as the ones in Kolkata, Delhi, Chennai, Allahabad and Benares, with well-thought-out strategies for their rejuvenation. But, *Current Science* stated in February, "Reinventing the Indian university will neither be

an easy task, nor will it be pleasant." Perhaps, therefore, the SAC-PM chose to ignore the problem altogether.

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