

for poor performance but yet wants a reserved 'quota' for NRIs! If one wants to use the scientific talent available outside India, why restrict it to NRIs? It is altogether a different matter, if these NRIs are going to raise the funds completely from their own resources and industries and not ask for any funding from the Government of India

One of the main contentions of the NSU proposal is the 'missing link' between research and teaching in the existing Indian institutions. Though it is a fact, I for one could not understand as to how this gap gets filled by starting from just the under-graduate studies alone, while the cream of students are going away to professional courses (technical education) just after the XII standard, before even knowing what science is! Looking from this point of view, one can see for oneself that the real malady in Indian science comes not because the research scientists do not go and teach, but because there is not really a receptive and inquisitive input into the science stream of the under-graduate and graduate programmes. It is again obvious that this is linked to the socio-economic standards of the country, whose society has not yet recognized (and has forgotten what was practised in the past) the role of good education! This cannot be changed by having just one National Science University for a small section with NRI connections, as the proposal does not mention anything about the mode of selections either of the students or of the faculty!

One would think that what is needed mostly, to induce young and promising

talents to science, is to make the profession conducive to compete with positions in public sector (bureaucratic) and private sector (managerial). Whether one likes it or not, today's society respects just power and money, neither of which exist in practising science. From this point of view the Mahajan proposal of giving \$ 50,000 for a scientist looks good, but restricting this to a selected hundred or so, would only make things worse! Moreover, the change needed is in the total working conditions in the existing institutions on the one hand and providing better living standards to the scientific community on the other. Just starting a new set up to help a few NRIs to have a 'working holiday' every year at the expense of Indian tax payers, would only increase the frustration among the existing scientific community of the country and create a wider gap between working scientists and science managers which could become totally detrimental for science in India.

Having looked at the bleak view, it is necessary to see what needs to be done and whether there are certain aspects in the proposal that could be useful. Again, as many have already pointed out, the proposal brings forth many of the common ills that are ailing the scientific edifice of the country, and in order to set it right the entire scientific community has to work hard and objectively. It is often quoted that India has the third largest scientific manpower of the world. This really is not true; for just having degrees in science does not make one a scientist. Science needs to be practised both profes-

sionally and morally and to this end what is required is a sound foundation of education. Thus one needs to build up for the nation a good and solid foundation of basic education in various aspects of life, viz. scientific as well as humanitarian values. Unfortunately, in the last couple of decades, the emphasis in education has been only on information content and not on knowledge. Someone who can rattle off a large amount of facts and figures is considered 'brilliant' and if the person can spread himself/herself wide, without being deep, he or she is even considered 'knowledgeable'. Of course, the main reason for this is our competitive examination systems in all walks of life which is often called 'objective tests', but is actually a 'memory test'. It is true that in the modern world of 'information technology', one needs to learn much more than what students did thirty years ago; but the emphasis in science needs to be more on understanding and thinking rather than collecting. This can be imbibed only if the basic (primary and secondary) education is given a proper perspective. One ought to consider these aspects more thoroughly and if the Government can afford, the extra money should go to basic education. One cannot build any structure without a proper foundation and even for doing good science, the foundation has to come from basic education.

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Support NSU but!

It is gratifying to note that Mahajan's proposal¹ for National Science University (NSU) has triggered a long over-due discussion on education and science. The Guest Editor of *Current Science* Balaram² hopes to have a debate which could 'prove valuable in setting an agenda for the future'. Earlier this year John Maddox has written an article on 'Science in India' (*Nature*, 1993, 366, 611-626). P. N. Srivastava has raised a number of issues concerned with science, education, excellence and accountability in his

Presidential address to the Indian Science Congress (January, 1994). NSU proposal could not be looked in isolation from the prevailing situations in education and science in the country.

We had excellence both in science and education in our universities when they had eminent scientists such as P. C. Ray, J. C. Bose, C. V. Raman, M. N. Saha, S. N. Bose, K. S. Krishnan and many others. They produced many students who joined universities and proved excellent teachers and also did good science. How-

ever, things changed after the independence with the coming of H. J. Bhabha and S. S. Bhatnagar on the scene of Indian Science. They were close to Pandit Nehru and they initiated the concept of big science and big institutions for science removed from the universities. A number of good scientists moved from the universities to various institutions set up by AEC, CSIR, ICAR, DRDO and others. The Universities became poorer not only in men but also in finances since the institutionalized science needed big

money and continued support of large funds.

The proposal for a National Science University is unique in many respects. It is utopian in concept and will be an oasis in the desert when established. It envisages a total faculty of 100–200 with a proportionate undergraduate population of 800–1500. In addition, it may have about 200–400 graduate (Ph D) students. Most of the faculty will naturally come from institutions such as TIFR, Indian Institute of Science, some universities, research institutions and IITs. This may weaken the existing institutions. It proposes to bring about 20% faculty from outside the country.

Adequate funding is most essential for an institution of this nature. Money is required not only for the costly modern equipment but it is also needed for their periodic updating or replacement. Obsolescence in scientific instruments and computers is getting faster each year. There may be doubts regarding appropriate financial support from the industry to an institution which is primarily meant for basic sciences when industry has hardly come forward even to support applied research. It will be disastrous if NSU comes under State funding at some future date.

NSU may take about 200–300 students each year after 10 + 2 stage on the basis of an all India selection. It is likely to attract a fair number of foreign and NRI students on payment of higher fees. The UGC is reported to be keen on tapping foreign students because of financial squeeze on the universities NSU will certainly provide the students solid foundations in basic sciences and may lead to excellent research in frontier areas which is one of its main objectives. But applied sciences, biotechnology, earth sciences and other fields of study and applied research needed for national

development programmes do not seem to find a place there.

A number of M Sc and Ph D students turned out by NSU will find positions in institutions such as TIFR, IISc and some universities. Many may like to go abroad for higher studies, research and other attractive careers. A few may stay in the NSU for research and teaching. But with the present dismal situations in the country it is doubtful whether institutions other than NSU could provide the same environment, facilities and prospects as students in NSU will get used to during their studies. Information technology, banking, financial services, consumer industries and engineering services are the most attractive and best paid professions in the country today and NSU graduates with basic sciences may not fit in these professions.

Mahajan does not talk about primary and secondary education levels in the country. He discusses the status of scientific research both in the universities and the government institutions. He talks about the many ills with 'feudal' system working to the detriment of everything in everyplace and 'coteries of science managers' who are 'never held accountable for their consistent over promise and under delivery'. However, Mahajan's proposal does not provide any solutions nor any hope for the future.

The objectives of education are primarily to build character and impart knowledge to enable each individual to fulfil his obligations to family and society, contribute to build the nation and improve 'quality of life'. The universities are expected to generate excellence in the literary, scientific, technological and professional fields. But in reality, primary and secondary education is in shambles. Our universities have multiplied and have become mostly 'inefficient degree-awarding machines' with scant concern

for vital societal obligations³.

The institutionalized science and technology is mediocre and there is neither excellence nor relevance to the needs of the country⁴. Balaram² says that whatever we have achieved in atomic energy, space and agriculture is 'adaptation and successful implementation of techniques already tested elsewhere'. There is a general perception that 'the ship of Indian science is floundering and rudderless'. We have failed in both the sectors—education and science—the two most important inputs for development of any society and country. NSU may just be a glimmer on the horizon. However, there are solutions^{3,4}. Hard decisions will have to be taken. Massive all-round developmental efforts through education, science and technology are needed to remove illiteracy and poverty, which in turn will help the nation to reform the existing institutions and establish many others to ensure healthy growth and excellence in every field. The country can march ahead with renewed dedication and vigour since—the talent, the infrastructure, the expertise and technologies—all that is needed for success is available. But when will the decision makers⁵ and the persons responsible for the implementation wake up to see the light?

1. Mahajan, S M., *Curr Sci.*, 1994, **67**, 503–508.
2. Balaram, P., *Curr Sci.*, 1994, **67**, 502–503.
3. Hari Narain, *Indian University System—Revitalization and Reform* (ed. Mathur, M. V., Arora, R. K₂ and Meena Sogani), Wiley Eastern Ltd., New Delhi, 1994, pp. 422–432.
4. Hari Narain, *Curr Sci.*, 1993, **65**, 739–742.
5. Hari Narain, *Nature*, 1994, **371**, 278.

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The proposal for a National Science University—some comments

One gathers from the October 10th 1994 issue of *Current Science* that a major new initiative aimed at providing high-quality science education from the undergraduate stage upwards is underway, with a massive investment of Rs. 200 crores from the Government being talked

about. While the proposal by Mahajan is by no means the first expression of concern for the existing situation or suggestion for action, it seems to be the first taken seriously in terms of Government support. One hears that many constraints which have shackled existing institutions

may be relaxed for the new one—hopefully the benefit will in time extend to the old ones as well! Given that such a substantial level of investment towards the specific goal of higher education in the sciences is being considered, the question of its optimal utilization is a natural