

accounting. The trust should eventually become self-sufficient and should be formed at the intersection of the Academia-Business-Industry nexus. The Management Trust will consist of retired academics, intellectually-oriented politicians, and intellectually-oriented doyens of industry with profound ideas for nation-building. The Management Trust will be the only one of the mentioned agencies that is not a ratifying agency.

Every two years the directorate of NSU, in consultation with faculty, students, interested external sources, and a panel of international academics will issue a 'State of the University' paper in which it will examine whither NSU is going and if that direction is in fulfillment of the basic philosophies, objectives, and modalities laid out in our charter. We must be asked periodically for honest evaluations of each of our departments and of the NSU as a whole.

In keeping with these ideas, NSU will solicit input from far and wide. NSU will maintain contacts with other institutions of excellence based on mutual critical appreciation and the realization that cross-breeding gives rise to newer and more potent strains. This will be done not only to promote the best in scientific achievement, but also to promote a sense of accountability and checks and balances.

### Special dispensations

For the greatest success for NSU, we must involve large groups of people in some aspects of its building and maintenance. Naturally, the primary source of expertise and funds will be the people and government of India. We will approach Indians living abroad for foreign

exchange requirements in addition, of course, to contributions to a University Permanent Fund. We will also approach Indians living abroad for donations of equipment and facilities so as to provide our faculty and students with as much freedom as we can to do science.

Another of the special dispensations will be that 20 per cent of the faculty will be mobile. The idea behind this is to encourage connection to and synergy with overseas Indians and overseas institutions. This will also add to the international nature of what we hope will be a world class university.

### Some preliminary estimates

We estimate that NSU will require of the order of a 100 crores as start-up cost. Additionally, NSU will require approximately 30 crores/year for operations. The operational costs could come from the revenue generated by investments of a trust of about 300 crores. The following agencies are likely to be the major donors:

- (1) Government of India—we will require an outright government grant.
- (2) Industry/Business—(A mature NSU-industry/business nexus would surely reap results of the type that would benefit both NSU and industry. This is especially true if one concentrates on the long term).
- (3) Non-Resident Indians—(Non-Resident Indians will be called upon, additionally, to make contributions of journals and books. Also, NSU will request these Indians to donate their expertise often in the form of sabbatical visits.
- (4) NSU will also require a land grant; and other sources of revenue in order to ensure maintenance.

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# The concept of a National Science University

*P. N. Srivastava*

When India got its independence, we had less than 20 universities and 700 colleges. Today we have about 200 universities (including institutions of national importance and deemed universities). During this period the number of students has increased from about 200,000 to about 4,500,000. The expansion by any standard is very vast. It is a different matter that with the vast development, proper infrastructure could not be created in many institutions with the result that today about one-third of

the universities and colleges are non-viable.

### The growth of higher education

The development of higher education since independence can be divided into three phases of about fifteen years each. In the first fifteen years, higher education developed at a rate of about 4–5%. This development could be sustained by India although the growth of economic development was only about 3%. In the middle fifteen years, the rate of growth increased to about 14–15%

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without much change in the rate of economic growth. The country could ill afford to enhance the much needed infrastructural facilities in the institutions with the result that the deterioration of universities and colleges started to which the political leadership did not give any attention.

For science education this period brought further deterioration since it was during this period that a large number of national laboratories was established where the salary scales and working facilities were much better than those which were available in the universities with the result many good scientists left the universities and joined the laboratories. The universities began to languish due to support and lack of leadership. Moreover, the universities suffered further due to stress more on quantity than quality.

In the third phase of fifteen years the growth of higher education came down again to 4–5%. The economic growth of the country can take care of this rate of growth but it is very difficult to remove the lacunae that have come in the system during the middle phase of development. The resources needed for this will be vast. The system in many institutions has deteriorated so much that today money alone will not be able to bring the desired results and proper atmosphere. Dynamic changes will have to be brought in the functioning of the universities.

### Expenditure on education

The expenditure on education has been increased from about 2.0% of the GNP to about 3.9% which is much below the stipulation of the government given in the National Policy of Education, 1986 that starting from the VIII Five Year Plan, the expenditure on education will be increased to a minimum of 6% of the GNP. The seriousness of our leaders towards education can be judged by the fact that this percentage of expenditure was also recommended by the University Education Commission headed by the late Prof. D. S. Kothari in 1964 and accepted by the government.

It is heartening indeed that the Prime Minister in his meeting with the Chief Ministers held a couple of months back has promised them that the expenditure on education starting from the IX Five Year Plan will be increased to a minimum of 6% which was stipulated to have been done from the VIII Five Year Plan. Let us hope this promise will be fulfilled.

It should, however, be kept in mind that even if the expenditure on education is increased by the government from the present 3.9% to 6% or even 7 to 8%, the government will not be able to support higher education. Its basic responsibility should be to take care of the primary and secondary education. For the tertiary level, it must ensure that any student coming from poorer families should not be handicapped in any way and should be provided with a freeship or scholarship. Efforts should

also be made by the government to increase the funding of higher education as much as possible and at the same time take advantage of the fact that the public today is prepared to spend for education of their children.

### Proposal for the National Science University

It is a well known fact that our contribution to either science or innovative technology of our times has been poor according to international standards. This opinion has been expressed by many scientists and technologists in India, Indian scientists and technologists abroad as well as foreign experts. Yet it will be wrong to say that our scientists have failed the country. In many areas our contributions have been significant although it could, no doubt, have been better. Given the right directions and financial assistance, India can become independent in many areas of science and technology of immediate relevance although there is no need to think of becoming absolutely independent in this growing interdependent world.

Keeping the above facts into consideration, a proposal had been made to the Government for the establishment of a National Science University. Some of our scientists in USA like Prof. Swadesh M. Mahajan had been very enthusiastic about this for a few years.

It is very well known that the idea of Jawaharlal Nehru regarding the establishment of national laboratories was to develop them in close collaboration with universities. However, when people like S. S. Bhatnagar started setting up national institutes totally independent of universities, Nehru's grand vision of science and technology had been given short shrift. The reasons for this had been given in my Presidential Address, Indian Science Congress, Jaipur (1994).

*Our basic drawback had been the neglect of science education. It has been shown that merely doing research without continued interaction with young enthusiastic student's minds is bound to become stale after a period.*

With directions from the Union Minister of Human Resource Development, the University Grants Commission had set up a committee to prepare a concept paper for the National Science University under the chairmanship of the author in July, 1993. The report was submitted to the UGC in December 1993. Steps were taken in right earnest and a presentation was made before the Prime Minister in April, 1994. A committee has now been set up to work out the structure of the University.

### State of Indian universities

Indian universities, in general, have remained a continuation of their colonial past. Even in their heyday



(and some of them did have such times) when decadence and apathy did not reign supreme, the best of our universities were universities only in name, they were primarily examining bodies presiding over a mere collection of colleges where memory-based learning eventually led one to the only notable end product: a college degree. Developing the pupil's mind to reason or to question was never encouraged if not downright frowned upon. Learning in any true sense has never been a part of the agenda. An institution of this description could never, without revolutionary changes, meet the challenge of creating the new scientist who will be the equal of his western counterpart in all aspects. In the early seventies a new concept was adopted in Jawaharlal Nehru University which did provide a change from other universities and has positively succeeded in many areas. How long it will continue is another matter since universities in India have not shown the sustenance that is seen in the western universities. Other institutions such as Tata Institute of Fundamental Research, Bombay or the Indian Institute of Science, Bangalore are very good institutions but basically they are research institutions. We need many more such institutions. At the same time a country like India needs at least 20–25 top grade universities where teaching should start immediately after schooling where undergraduate students could be engaged by the eminent scientists who trigger the sparks in their minds. Unless there is a continuous input of young minds with originality and bright ideas into science, it would be unreasonable to expect major advancement in basic research. *Conceptualization and execution of this important aspect is not being done by any of our universities, institutes or national laboratories.*

### **Objectives and structure of National Science University**

Our new experiment in building a lasting, active, innovative and creative structure of science must have solid unshakeable foundations. We have to realize right from the outset that if the Indian university had not been driven (by poor policy and resulting poverty) into the ground, it would be an unacceptable modality for fostering higher education. It is just not founded on the principles which make a 'University'; its original mandate was to produce clerks and civil servants, and we have never seriously questioned this legacy of our recent past. We have merrily gone on increasing the number of such universities. This mushroom growth without proper infrastructure compounds the difficulties of any overhauling programme to be undertaken. A revolutionary and massive programme of rehabilitation is needed to set the universities in order, and it is hoped that at least some of them could be saved from further decay

and may even be made real universities. But, along with this, and also to create a model to emulate, we have to start a separate, well thought out constructive programme to design and build a new university suited to meeting the challenges of a rapidly changing scientific scene.

*We must stress that in the domain of higher education today, the great need of our society is not mere education or more education, or education for more students, but better education, in fact, absolutely good education for those who deserve it, imparted by the best that our society can come up with. Our best scientists must not only teach undergraduate courses, but be around them hence the university is proposed to be hundred per cent residential for all the faculty, students and employees. It is during these formative years that a bright young mind can either be excited and inspired to seek higher knowledge or be relegated to the pursuit of mediocrity.*

Traditional education in our universities manages to destroy any curiosity, any inquisitiveness, any drive to excel, any spark that the student may have. It is hard to imagine how some students still retain the lust for knowledge even after a few years of living in the intellectual desert that our universities generally are. There are many such exceptions, of course, but these are always in spite of the system. Kindling their questioning, analytical and intuitive abilities has to be a high-priority task of an education system. The best of our students deserve to be taught by those who have achieved distinction in their line of work and who are actively involved in research and investigation. It is generally believed that the sheer presence of an active, eminent scientist can trigger the imagination of young minds.

The National Science University (NSU) idea has been proposed as a possible vehicle for beginning the transformation so sorely needed to raise qualitatively the standard of our scientific research. Needless to say, the level of science and of science education are intimately and inextricably connected. *The new University, NSU, must aim to be what the current universities cannot be at this juncture.* Obviously, it must incorporate in its charter the well-understood characteristics of a great place of teaching, learning and research.

The new university must necessarily and categorically reject all the feudal values which have plagued our institutions both universities and scientific institutes. There will be no more scientific leadership *by appointment*, no steep concentration of power, no rigid and suffocating hierarchy, no scientific administrators posing and acting as scientists (and hence controlling the fate of science and scientists). Moreover, a scientist's scientific status should be completely independent of his administrative title.

The model university will have a highly interactive collection of select undergraduate and graduate students and the best available faculty. The students will be given every facility such as easy access to well-stocked library and well-equipped laboratory. We are confident that the last one is not an impossible task. There are a large number of Indian scientists (in India and USA) who would whole-heartedly participate in this crucial aspect of nation building if they could work in surroundings more congenial than those provided by the existing Indian institutions. What we want is a place where: 1. Best of our scientists teach, train and inspire the next generation; 2. Our scientists can work in a free democratic set-up, i.e. a large number of essentially equal, independent professionals can compete, cooperate and collaborate with each other to create an exciting scientific environment which, in a natural fashion, will produce good, well-equipped, and brilliant scientists from our youth; 3. One's scientific status is not measured by one's administrative title; 4. Scientific leadership is neither absolute nor given by appointment or by nomination but emerges in a natural fashion amongst scientists of different age groups and is only comparative and changes with time; 5. Science, its creation, its teaching, and its dissemination is the principal (if not the only) activity; the scientists and the would be scientists are the principal citizens and every one else has only a supporting role; 6. There are absolutely independent career ladders for scientists and administrators; no scientist should ever feel the need to become an administrator for more money, facilities, power or prestige. From all points of view, the most desirable position should be that of a scientist-teacher; 7. All principal scientific and academic decisions are made by faculty committees consisting of working scientists; administrators must take care of only administrative matters and scientists of scientific matters. Again, the idea is not absolutism but the encouragement of the logic that those involved in the actual doing of science are repositories of wisdom which may not be available to others, peripheral to the core responsibility of the university.

The preceding description is more of a statement of intent than a detailed description of either the objectives or the structures of NSU. The primary and basic objective is to create a first-rate university—a place for advanced teaching and research, a place with a scientific, investigative ambience, a place where truth is sought with vigour and dedication and where appropriate conditions are created for doing all that. Naturally, there is no ready-made recipe to meet this tall order.

### Resources

Since NSU will have government (one-time grant) as well as private sources of funds, we will need to create

a management trust, which will form the so-called 'incorporation' part of the university. This trust must be quite eclectic in nature with its members drawn from all relevant sources in the Indian polity. It should be a healthy mixture of business/industry and academic representatives and will be in charge of looking after the financial health and well being of NSU. The trust will handle investment, creation of new sources of funding, trouble-shooting and accounting, and should be self-sufficient, i.e. the income from investment should be sufficient for running as well as the growth of NSU. It is obvious that finding the right people for the trust must be given top priority.

It is proposed that the Government should allocate Rs 100 crores as start up capital and contribute another 100 crores towards the formation of a permanent University fund to be invested and administered by a trust. Another 200 crores will be raised from the Non-Resident Indians and from business and industry. For the NSU to meet its goals, an annual recurring expenditure of Rs 35–40 crores will be needed. As already indicated earlier, the fund needed from the government will be only one-time grant and in future the university will have to find its own resources to run as well as develop the university.

### Administration

The administrative structure of NSU will have to be worked out by a suitable panel after approval 'in principle' of the concept. We must stress that NSU is a brand new experiment for our country. We cannot wholly or even partially take an established structure and impose it on NSU since that would be against the very spirit of the experiment. It will, however, be ensured that the administrative expenditure is kept to the minimum and under no circumstances is allowed to go beyond 25% of the NSU budget. (The information is that, at present, some universities spend as much as 50% of their budget only in administering the university.)

With a fundamentally different guiding philosophy, and with intentions of making a non-feudal, non-bureaucratic, internally democratic, free and exciting home for the creation, perpetuation and transmission of knowledge, we will have to settle for a slowly evolving structure. We can afford to be definite only in the concept of what we want and even the concept has to be sufficiently flexible so that the possibility of growth and new learning is not diminished by definiteness. We should begin with an unavoidable minimum of structure and let the rest emerge organically from the interactions and deliberations of the main participants—the faculty, the students, the trustees and the International Advisory Committee.



The NSU, devoted to the cause of excellence, has to have a modest size. Excellence, by definition, is not a common commodity and its maintenance will be rather expensive. It is obvious that NSU is expected to be and will be an academically elite educational institution. But elitism, in case of NSU, will come only from a student's ability, her/his interest in science and research, and her/his dedication and commitment. Once admitted through open competitive selection, he will not have to drop out because of her/his family's financial inadequacy. Her/his education will be supported by the university through advancing financial resources for which proper arrangements will be made. The university will not be run through capitation fee charged from the students. A bright young person devoted to learning is society's

greatest treasure; it will be our responsibility to give them the best education at a cost they can afford. To start, the university should be able to support a student body of 1000–1500 and a faculty of about 200 to 250.

It must be stressed that the concept of the National Science University is a fundamental departure from what is existent; it is anything but an extension of the current university concept. The university will have to be funded with full recognition that almost every modality proposed is new; we need all this newness to be scientifically and technically ready to meet the challenges for the years to come. And finally, if the experiment succeeds, we are sure that many more universities will be established with the support of the public, business and industry.

## On the proposed National Science University

*D. Balasubramanian*

A proposal has recently been made to open what has been termed as the National Science University (NSU) of India. The idea seems to have been mooted by some Non-Resident Indian (NRI) scientists, notably by Swadesh M. Mahajan, a physicist from Texas. The plan envisages the establishment of a corpus fund of Rs 400 crores, the annual interest from which would take care of the running expenses of the university. It is understood that the Government of India is favourably inclined to this proposal and might be asked to contribute a one-time grant of Rs 200 crores or 50% of the corpus fund. This amount will mainly go to set up the infrastructure, building and physical facilities. The other half of the corpus fund is expected to be raised through investments by NRIs and industrialists. A concept document has been prepared by Mahajan which is doing the rounds in various places in India (*Current Science* has been able to obtain a copy of this document as well).

### The concept and its promotion

This idea of the National Science University is being championed by P. N. Srivastava, former Vice-Chancellor of the Jawaharlal Nehru University, New Delhi and former Member, Planning Commission. Srivastava has said that he has received enthusiastic responses on this matter from Arjun Singh, Union Minister of Human

Resource Development and Manmohan Singh, Union Finance Minister. Recent newspaper reports have indicated that Srivastava was taking this matter to the Prime Minister for his concurrence. In an earlier interview to the press, Srivastava was quoted as saying that it is a 'New concept in university education, not a type of any existing university. Rules and regulations will be really at the rock bottom and administrative expenditure will be kept below 20 per cent of the total'. He is also reported to have stated that discussions have already taken place for obtaining suitable land for the purpose of establishing the university in the vicinity of Delhi and that the Governments of Haryana and Rajasthan have expressed interest. It has been further mentioned that Srivastava heads a committee set up by the Minister of Human Resource Development to go into the details and feasibility of the NSU and that this committee has submitted its report.

There are several interesting points that emerge from this issue. The very first is the refreshing possibility that rules and regulations will really be at the minimal level and that administrative expenditure would be kept at the rock bottom. Anyone familiar with the finances of higher education in India, and universities in particular, would know that more than 70% (often as much as 90%) of the budget of a university is spent on staff salaries and maintenance, leaving precious little for the *raison d'être*, namely teaching, research and development. Even first class institutions such as the Indian Institute of Science, Bangalore, the Tata Institute of Fundamental Research, Bombay and the IITs spend most

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