Science today in higher education and its requirements

There has been increasing awareness about the status and quality of science – teaching, research and management – in the country during the last decade and if the correspondence published in *Current Science* in 2003 only (till June 10) is considered, there have been about two dozen letters along with four editorials on its general decline, standard of research and quality of Ph Ds produced, rating, ranking and assessment, indifferent teaching and the suggested contractual appointments of UGC, reactions thereon, and related matters. In addition there has been a review in *The Hindu* (20 March 2003) by C. N. R. Rao. Some of the causes highlighted for the decline in the quality and the quantity of the Indian contribution to science are the following:

- Lack of infra-structural facilities in the Universities.
- Non-availability of funds at the right place and at the right time.
- Absence of team and collaborative work.
- Poor standard of research journals.
- Lack of excellence in the research workers.
- Want of commitment and motivation among the workers.
- Absence of encouraging administrative environment.
- Over-emphasis on information technology, and engineering.
- Parents planning to send their wards abroad right from the Intermediate classes.
- Degeneration of higher education into mass education by the Government. Any attempt to introduce any reform in the higher education with respect to infra-structure, funds, excellence, etc. becomes a casuality in view of these factors

The greatest single factor for decline in the quality of higher education is its degeneration into mass education. No attempt has been made at the social, political or state level to educate the people about the meaning of education, job-oriented education and higher education. The first step is to become aware of this wrong and stop further spread of higher education at the current scale at least for the time being, and consolidate it in terms of quality. It is true that political leaders and public cannot appreciate excellence in higher education and its irrelevance to masses, but have we made any effort to make them understand this at length? Have we ever protested?

Several of the causes given in the list hinge on one fact: whether we can make our scientific services better than the existing ones, and competitive in facilities and service conditions with the ones available abroad in developed countries so that migration of our talent to foreign countries could be discouraged and reduced to the desired extent. Young men and women educated and trained by the resources of the country should not be allowed, by legislation, to serve in other countries unless sponsored by the Government. How long shall we be blind to this unproductive investment for which there is no return for our country? A visit to the foreign countries by students for further studies and training should be restricted to (say) five years at a time and after that they should return to the country and pass on the benefits of their improved knowledge to others who are less fortunate. In view of this restriction, it is quite logical that our scientists should be adequately compensated in the country.

A step which is likely to improve the standard of science is to have a separate cadre for heads of the departments, sections and divisions, and for which the appointments should be made by opinion and invitation and not by selection. It should have a five-year term, renewable for another term. The incumbent is required to possess the qualities of academic and administrative leadership.

Yet another way to achieve excellence in higher education in science is to have a mechanism by which the talent of the country in required number is picked up right after Intermediate/twelfth standard through a competitive procedure for an integrated study leading to a Ph D degree and ensuring for the candidates, assured jobs in a cadre like IAS, Indian Scientific Service (ISS). Such selected candidates may be provided facilities for study and training in one of the nine/ten institutes existing or started for the purpose, throughout the country. No admissions other than from ISS should be made in such institutions. Successful candidates should be appointed in the cadre in advanced national research centers, national laboratories and some of the chosen Universities as per requirement of a particular institution. It is good that IISc is conducting an entrance test for the Ph D programme recognized by many advanced institutions, but it would be still better if it is integrated with B Sc course and ensures a job in the selected national institutions of the country.

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Science reporting in regional languages

I read with great expectation the news report, 'Training popular science writers in regional languages'[1], intrigued by its title. I was, however, disappointed. The report abounded in generalities like how good it would be to train young people in popular science reporting and so on, and there was no mention at all whether the proceedings of the workshop were conducted in Gujarati! Visits to museums, science centres, etc. would no doubt be educative in the sense that the trainees may be induced to make the necessary extra effort for describing what they saw in their own language. But did the work-

shop ever get down to brass tacks – tackling the primary, and the more difficult question of creating terminology, scientific or 'merely' technical, in the 'regional' languages?

Latin and Greek, in which Renaissance scholars were adept, have been the sources for the invention of scientific terminology for European languages. It cannot be helped if Sanskrit has played (or can be made to play) an effective role as *the* source of terminology in India, primarily because rules of word-formation are both deep-running and clear-cut in the Sanskrit linguistic process. But the present usage of scientific and technical terms in Indian languages, even those derived primarily from Sanskrit, is not standardized and is, in some instances even unacceptable [e.g. *dhooma shakata* (='smoke cart') or its equivalent in the vernacular for 'steam engine']. The usage also differs from region to region [e.g. interchangeable (and somewhat incorrect) usage of *ushna* and *thaapa*, which differ in sense in different regions, for (thermodynamic) 'heat'; (*gharma* or *ushma* would do better)]. A concern with the elementary aspects of linguistics can help in the development of a scientific vocabulary (developing a standard terminology for science teaching with due deference to regional/cultural variations) for use in textbooks throughout India, leave alone the matter of writing 'popular science' for the common person. Bodies of eminent scholars, resembling *l'Academie Francaise*, must be formed in every state as adjuncts to the various 'Akademies' that already exist. Members of these 'akademies' must be persons who have attained eminence in writing in their regional languages but have yet not lost touch with certain regional folk elements/traditions. They must be able to command authority and recommend the usage of terms for recording technical information in Indian languages. They must also be able to arbitrate on matters of dispute in usage. Above all, presumably having, a correct scientific/technical background, must be able to hold constructive conclaves in order to act creatively in developing terminology with new words. If the educational policy is going to be to keep Indian languages alive and not allow them to get swamped, forgotten and replaced by 'convent school English', urgent action is needed.

1. Narottam Sahoo, *Curr. Sci.*, 2003, **85**, 124.

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Statistics and pure mathematics vs bibliometry science

With great interest I read the letter by Karandikar and Sunder[1]. So far as their conclusions are concerned, I agree with them. Also I appreciate their suggestion for the improvement of Indian journals and science in general. However, I disagree with the authors when they discredit an established subject like bibliometry science.

'We should be supremely wary before letting non-specialists dictate steps to take on specialized matter' write the authors. I wonder why a mathematician and a statistician enter in others' terrain and 'dictate conditions' to social scientists as in the case of bibliometrists?

History shows that in terms of religion and philosophy, the word science as such was used first in 1340 (ref. 2). One of the definitions of science is: 'The state or fact of knowing; knowledge or cognizance of something specified or implied; also, with wider reference, knowledge (more or less extensive) as a personal attribute. . . .'[2]. According to another definition science is the 'Knowledge acquired by study; acquainted with or mastery of any department of learning'[2]. In modern use the term science is: 'Often treated as synonymous with 'Natural and Physical Science', and thus restricted to those branches of study that related to the phenomena of the material universe and their laws, sometimes with implied *exclusion of pure mathematics*' (emphasis added)[3]. This restricted term for science was used for the first time in 1867 (ref. 3).

From the foregoing paragraphs we see that pure mathematics is not 'real' science. Should we discredit applied mathematicians? Should we not take their results seriously as they are not doing 'real' science?

What about statistics? Is it 'exact' science? According to one of the old definitions, statistics is: 'That branch of political science, dealing with the collection, classification, and discussion of facts (especially of a numerical kind) bearing on the condition of a state or community. In recent use, the department of study that has for its object the collection and arrangement of numerical facts or data, whether relating to human affairs or to natural phenomena'[4]. From physicists' point of view, statistics is: 'A branch of science, or a physical process or condition: *not absolutely precise* (emphasis added) but dependent on the probable outcome of a large number of small events, and so predictable; *statistical mechanics* (emphasized in original), the description of physical phenomenon in terms of a statistical treatment of the behaviour of large number of atoms, molecules, etc. esp[ecially] as regards the distribution of energy among them;.... '[4].

The following two examples show the problems of modern statistics.

(1) Temperature of a body is the average value of the motion of particles (atoms/molecules). Is their any statistical scientist who can pick out 'the' atom/molecule, which has the same temperature as that of the given sample?

(2) Take a piece of a radioactive substance. Is there any natural scientist, who could tell that in the following event 'this particular' atom/molecule will decay?