

## Does India shine in scientific research?

During my teaching and research career of forty years, I have been associated with all the universities in Punjab. Punjab Agriculture University (PAU), Ludhiana adopted the American model for teaching and research, since its inception, under a collaboration with Ohio University at Columbus, Ohio. As a consequence, the Green Revolution was ushered in India by PAU scientists. Panjab University, Lahore was set up in Hoshiarpur and Solan after partition and it moved to Chandigarh in 1957. It had a good tradition of scientific research in basic sciences since its Lahore days in 1924, when S. S. Bhatnagar introduced the Honours system at B Sc level, followed by a full term of research leading to M Sc (Hons).

Punjabi University, Patiala was set-up in 1962 for promotion of Punjabi language and culture in Punjab. Its main contribution has been in the field of Punjabi language and literature, and a study of comparative religion. Guru Nanak Dev University at Amritsar was established in 1969 to promote study of Sikh religion and for propagation of Guru Nanak's teachings at the global level. The university has done well in sports, applied science and technology, and social sciences.

Was it mere coincidence that all the universities in Punjab have been rated as top-ranked ('five-star' status) by the National Assessment and Accreditation Council (NAAC)? Was it on the basis of scientific research that the universities were top-ranked or were there other extraneous considerations? Bibliometric analysis of scientific research<sup>1</sup> carried out in 1980, revealed that out of four universities in Punjab, three were included among the top 25 institutions in India. But a repeat survey<sup>2</sup>, carried out by National Institute of Science, Technology and Development Studies (NISTADS), New Delhi reveals interesting results. None of the universities in Punjab occupies a rank among the top 20 institutions in India, except the Post Graduate Institute of Medical Education and Research, Chandigarh which is rated as the second best in India in

medical sciences. During the last 20 years, there has been a fall in research output both in quantity and quality, as revealed by the survey.

Using the Science Citation Index of Institute for Scientific Information, a survey reveals a dismal state of affairs in scientific research in India at the global level. During 1980s, India occupied the 8th position among the top 20 nations of the world in scientific research. During 1990s, India came down in rank to the 12th position, after Italy, Holland, Spain and Australia, with only one-tenth of the scientific manpower available in them compared to that in India. It clearly shows our per capita productivity is much lower compared with that of the Europeans; what to speak of the Japanese and Americans who are far ahead? With decline in scientific research, India is now out of the top 20 nations. Compared with India, scientific productivity of China, South Korea and Japan, our Asian giants, has increased immensely.

The commentary on slowing down of Indian science by Gangan Prathap<sup>3</sup> sends a shiver down the spine while one is blowing the trumpet about 'India shining' and the 'feel good' factor.

Let us look into factors which are responsible for the decline in scientific productivity in India:

- (a) After 1980s, there is a paradigm shift in the choice of careers by young Indians. There is a sharp decline in the number of students seeking a career in scientific research. (b) The number of R&D scientists/engineers in India is around 157 per million, which is 1/50th of the corresponding figure for South Korea and 1/30th that for USA or Japan. (c) Considering all the fields of science, India ranks 21st in quantity of research papers published, but when we introduce a measure for quality (*SCI*), its rank drops to 119 among 149 nations considered in the survey report (CD-ROM). (d) Our productivity is 20 papers per million, while the corresponding figure for

USA is 1000 per million. We are lagging behind China, South Korea and Japan.

(e) Our share of global output in R&D is only 1.58%, while we have 17% of the global population.

(f) Our R&D expenditure per capita is 1/100th of South Korea and much lower compared to other scientific giants at the global level.

(g) The Indian scientific establishment is bogged down by too much bureaucratization which hinders the growth of science.

(h) Universities have been ignored in comparison with reputed scientific establishments, so far as funding of scientific research is concerned.

(i) Our science managers and planners did not encourage open-ended research, but laid more emphasis on target-oriented research in some thrust areas, namely defence and atomic energy, at the cost of basic sciences.

I agree with Gangan Prathap when he echoes my sentiments: 'the men we celebrate today are mission-mode managers, institution-builders, network managers and system-integrators, and the would-be giants of science (the Sahas and the Ramans) have now withered away under these great banyan trees of the mega-organizations performing strategically targeted S&T'. If we want to have India shining in scientific research during the 21st century, we must look into the factors which impede the growth of science in India, particularly in the university system.

1. Mehrotra, R. and Lancaster, F. W., *Curr. Sci.*, 1984, **53**, 684-687.
2. Basu, A. *et al.*, NISTADS report, New Delhi, January 2000.
3. Gangan Prathap, *Curr. Sci.*, 2004, **86**, 768-769.

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