science funding and science education are valuable and need to be reflected upon, since our country has just started experiencing globalization and all walks of our life are being influenced by it.

The government is not in a mood to invest in the universities, even though it has already been emphasized that the current spending of 3% of GDP on education is not sufficient. The government has been adopting a lukewarm approach towards higher education by not filling up teaching positions. This approach has been in place in hundreds of colleges and universities. Are we waiting for our current institutions to die so that the path can be paved for private initiatives or foreign intrusions?

In spite of all the brickbats our institutions of higher learning receive occasionally, IISc, IITs and central universities and other well-funded institutions have fared well in the international scene. However, we need to have a close look at the majority of our universities which are currently neglected and underfed, except for the 5th Pay Commission salary for the permanent faculty.

Recently, there have been discussions at coffee-tables/lunch rooms and in journal columns about universities earning money for themselves. This might have come from the Western mindset of looking for material profit out of every thing! There is an overemphasis on money-making through applied research, consultancy, inviting private initiatives and so on. While there is no harm in income generation if possible, the primary duties of universities should not be forgotten. Ironically, the current mood of the government, if continued, may lead to a heavy drain on the intellectual think-tank of our country, by encouraging students to move away from basic sciences.

Investment in institutions, infrastructure and people are other factors on which emphasis is placed by Rao. We have clear examples in the case of our national institutions, IISc and IITs, where reasonable investment was made by the government yielding good results. Our quality manpower in areas like computer science, atomic energy and IT has helped the country march ahead in areas where foreign collaboration is often not possible, or at times when other countries have refused to share information. Living in isolation is not possible in a shrinking world and especially in science – for science is international. Globalization seems to have come with a craze for foreign collaborations and affiliations. Are we heading towards a potential East India Company syndrome or slavery to foreign educational institutions? Many private agencies may be looking at this as a lucrative business opportunity.

Globalization seems to be an inevitable reality. During this transformation, we should maintain our identity, while adopting Western models. I hope our policy makers will pay attention to the concerns of Rao.

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Is science in India on the decline?

There is a vast difference between the rich and the poor countries in every respect. The difference is pronounced in scientific and technical research. As early as 1977, John Davidson Frame Jr., an outstanding American scientometricist, pointed out that the distribution of science was even more skewed than the distribution of wealth among nations. Frame's statement was confirmed by Eugene Garfield in his perceptive 1982 Annual Magnus Pyke Science Policy Foundation Lecture, 'Third World Research: Mapping Science in the Third World'. Garfield showed that 122 developing countries put together had accounted for only 5% of the world's 353,000 papers as seen from *Science Citation Index* (*SCI*) 1973. Indian scientists were responsible for close to half of the Third World's publication output in 1973 and India with 7888 papers, was the eighth largest publishing nation in the world after USA, UK, USSR, Federal Republic of Germany, France, Japan and Canada. Argentina was the only other Third World country in the list of 25 countries publishing the most number of papers in 1973. I wanted to see where India stands

Table 1. Leading contributors to the literature of science (data from *SCI*)*

No.	Country	Number of papers *SCI* 2000	Number of papers *SCI* 1998
1	USA	2,62,892	2,61,826
2	Japan	68,056	67,568
3	UK	63,972	62,454
4	Germany	63,365	64,184
5	France	44,990	45,571
6	Canada	31,929	31,166
7	Italy	31,673	30,936
8	Russia	23,041	22,824
9	PR China	22,061	14,610
10	Spain	20,546	19,796
11	Australia	19,067	18,404
12	The Netherlands	18,826	18,581
13	Sweden	14,278	14,197
14	Switzerland	13,828	13,418
15	India	12,127	12,128
16	South Korea	12,013	9444

*Years refer to *SCI* CD-ROM disc years and not year of publication of papers.

Table 2. Number of papers published by five selected countries as seen from *SCI* over two decades

SCI disc year	India	China	Israel	South Korea	Brazil
2000	12,127	22,061	9292	12,013	9565
1999	12,521	17,138	9241	10,918	9083
1998	12,128	14,610	9544	9444	7917
1997	11,067	12,630	8938	7728	6954
1996	11,177	10,152	8338	6227	5895
1995	11,084	9713	8141	5125	5289
1994	11,319	8226	7787	3684	4381
1993	10,978	8087	7563	4318	4043
1992	11,160	7630	6755	2248	3946
1991	10,468	6630	6206	1818	3438
1990	10,103	6509	6211	1448	2973
1989	10,426	5491	6262	1332	2697
1988	10,208	5312	6861	1075	2492
1987	10,239	4048	6948	944	2859
1986	10,854	3678	6729	773	2951
1985	11,222	3238	6792	664	2511
1984	10,600	2537	5570	440	1915
1983	12,059	2974	6236	442	2248
1982	12,124	2592	6058	321	2306
1981	13,119	1544	5560	254	2374
1980	14,983	924	5733	175	2215

Table 3. Per cent share of world research in different fields for selected countries as seen from different international databases

Research share in	TB (*PubMed* 1990–1999)	CVD (*PubMed* 1990–1999)	Diabetes (*PubMed* 1990–1999)	New Biology (*BBCI* 2000)	Mathematics (*Mathsci* 2000)	Chemistry (*CA* 2001)	All science (*SCI* 2000)
India (%)	5.34	0.66	1.11	1.35	2.02	2.5	1.55
China (%)	1.11	1.04	0.63	2.03	10.35	9.8	2.83

TB, Tuberculosis; CVD, Cardiovascular diseases.
Source: Arunachalam, S. and Gunasekaran, S., *Curr. Sci*., 2002, **82**, 933–947.

now and made a quick search of *SCI*.

In fact, India's rank has slid to 15th in 1998 and 2000 from 8th in 1973 (Table 1). To see India's performance in perspective, I compared the number of papers published by four other countries, viz. People's Republic of China, South Korea, Brazil and Israel, in the past 20 years. The growth has been spectacular in China and South Korea and very impressive in Brazil and Israel (Table 2). China's output rose from 924 papers in 1980 to 22,061 papers in 2000. During the same period South Korea's publication output rose from 175 papers to 12,013 papers, Brazil's output rose from 2215 papers to 9565 papers, and Israel's output from 5733 papers to 9292 papers. In 2000, China occupied the 9th rank and South Korea the 16th rank (Table 1).

Many people have reservations about using *SCI* data for measuring the volume of research carried out in different countries, as it covers only a few thousand journals and in particular its coverage of developing-country journals is poor. Table 3 presents data for papers from India and China indexed in several other databases. In chemistry and mathematics, China accounts for about 10% of the world's research output, compared to less than 2.5% from India.

Over two decades the number of research papers has risen by a factor of 23 in China, by a factor of 68 in South Korea and by a factor of 4.3 in Brazil, but it has decreased in India. Are we not investing enough on science in India? Are not our scientists productive? Is there something that holds us back?

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