

I may not be able to recall all the details.

I was asked by the Editor to contribute an article for *Current Science*. Similar invitations seem to have been sent to other scientists as well. I notice that a good number of articles, in Vols 51 and 52 (1982, 1983), published in this category are in the nature of reviews, mostly by a single author. Regular research articles featuring new results seem to appear under the headings 'The Articles' and 'Short Communications'. Basically, my paper was an invited review article, covering substantially the results published in scientific journals along with my colleagues as co-authors and the results from other workers referred to in the article (for example, I. Rhodes *et al.*, *Proc Roy. Soc.*, 1963, 273, 247; 2. Ku *et al.*, *Solid State Commun.*, 1980, 35, 91). One scientist who is intimately connected with this work from the beginning and made important contributions is my colleague Prof. S. K. Malik. My student Dr. S. K. Dhar's thesis was completed in 1982, and while the PhD work was going on, we also wrote a few papers (listed below) for publication based on the work. At the end of the review article, I had expressed my gratitude to my colleagues of the Solid State Physics group (which includes my student) for the help, and to Prof. W. E. Wallace of

the Chemistry Department, University of Pittsburgh, USA, where some of the measurements on the magnetic properties of rare-earth rhodium borides, reported in the article, were made. As the *Current Science* article contains the salient information featured in the following papers, it is possible that the text of a chapter of the unpublished thesis was not changed in the review article.

- 1 Dhar, S. K., Malik, S. K. and Vijayaraghavan, R. (Tata Institute of Fundamental Research, Bombay 400 005, India), Strong itinerant magnetism in ternary boride $CeRh_3B_2$, *J Phys C Solid State Phys*, 1981, 14, 321
- 2 Dhar, S. K., Nagarajan, R., Malik, S. K. and Vijayaraghavan, R. (Tata Institute of Fundamental Research, Bombay 400 005, India), Valence state of europium and magnetic ordering in $EuRh_3B_2$ - ^{151}Eu Mossbauer study, *Proc INSA*, New Delhi, 1982, p 792 Special volume on International Conference on the Applications of the Mossbauer effect, 14-18 Dec 1981
- 3 Malik, S. K., Dhar, S. K. and Vijayaraghavan, R. (Tata Institute of Fundamental Research, Bombay 400 005, India), Magnetic and NMR investigation of RRh_3B_2 (R = La to Gd) compounds, *J Appl. Phys.*, 1982, 53, 8074
- 4 Malik*, S. K., Vijayaraghavan*, R., Blotich, E. B., Wallace, W. E. (Department of Chemistry, University of Pittsburgh, Pittsburgh, PA 15260, USA), and Dhar, S. K. (Tata Institute of Fundamental Research, Bombay 400 005, India), Itinerant magnetic ordering in $EuRh_3B_2$, *Solid State Commun.*, 1982, 43, 461

- 5 Malik*, S. K., Vijayaraghavan*, R., Wallace, W. E. (Department of Chemistry, University of Pittsburgh, Pittsburgh, PA 15260, USA), and Dhar, S. K. (Tata Institute of Fundamental Research, Bombay 400 005, India), *J Magn. Mat.*, 1983, 37, 303

*Permanent address: Tata Institute of Fundamental Research, Homi Bhabha Road, Bombay 400 005, India

Also, my colleagues Dr S. K. Dhar and Prof. S. K. Malik continued to work on this system using other techniques around the same time and published the following two papers:

- 1 Devare, S. H., Dhar, S. K., Malik, S. K. and Devare, H. G., Quadrupole interaction in RRh_3B_2 compounds, *Hyp Int*, 1983, 15/16, 705
- 2 Hakimi, M., Hubner, J. G., Delong, L. E., Malik, S. K. and Dhar, S. K., Temperature dependence of electrical resistivity of itinerant ferromagnetic $CeRh_3B_2$, *J Less Comm Metals*, 1983, 94, 153

During my long research career of over 40 years, many colleagues who had obtained their Ph D degrees working with me have grown as distinguished members of the condensed-matter physics group. Dr. S. K. Dhar is one of them and we continue to work together.

R. VIJAYARAGHAVAN

Tata Institute of Fundamental Research
Homi Bhabha Road
Bombay 400 005, India

Indian science slows down

References 1 and 2 published macro-level scientometric indicators showing national performances in publication output for the eighties. Indicators for the first half (1980-1984) and the second half (1985-1989) were determined separately so that relative change could be measured. These indicators were compiled from the Science Citation Index (SCI) database. Five major fields

were identified: life sciences - clinical medicine, biomedical research, biology; physics - physics, earth and space sciences; chemistry; engineering; mathematics. All countries which published at least 50 first authored papers in the field in question during the periods of study were included.

Table 1 shows an extract from the various tables appearing in References 1

and 2. A worrisome slowing down of the Indian science is apparent. While the world output increased by 9.7% from the first half to the second half of the decade, India's contribution dropped by an alarming 17.8%. There was a gradual decline in all areas of science, except for engineering, where India barely held its own share of world output.

These are crude measures relating to quantity. Measures of quality in terms of citation impact from References 1 and 2 show that although India had the 10th rank among 173 countries when ranking was done by percentage share in world publication output in 1985-1989 for all science fields combined, its rank dropped to 70 when ranking was done using the mean observed citation rate as a percentage of the world average during the same period. It cannot, therefore, be argued that an actual trimming down of excess fat to produce work of better quality was taking place during the decade.

Table 1. India's publication output (world share in brackets) and change from 1980-84 to 1985-89

	1980-84	1985-89	Change from 1980-84 to 1985-89
Life sciences	21,570 (1.9%)	15,909 (1.3%)	-26.2%
Engineering	6746 (3.2%)	7586 (3.2%)	+12.5%
Mathematics	1846 (3.6%)	883 (1.9%)	-52.2%
Physics	12,687 (3.4%)	11,598 (2.7%)	-8.6%
Chemistry	14,030 (5.3%)	11,718 (4.1%)	-16.5%
All sciences	57,655 (2.8%)	47,372 (2.1%)	-17.8%
World total for all sciences	2,026,902	2,223,883	+ 9.7%