Bharatiya Vaisajya Tattwa in Bengali and Hindi (1934). He edited and published popular health magazines like *Health and Happiness* in English, *Swasthya Samachar* in Bengali, and also the Hindi and Urdu versions of the latter. The idea was to spread health consciousness and medical knowledge among the lay public. The magazines were extensively read and praised highly by eminent personalities including Rabindranath Tagore. Bose was a much revered man during his lifetime (1873–1955). He led a simple life, was averse to publicity and worked tirelessly to fulfil his vision. National newspapers have highlighted his achievements at intervals. A street in Calcutta is named after him. His full biography exists in Bengali and articles have been written on him at different times. Goodman and Gillman mention the pioneering contributions of Sen and Bose to the general principles of psychopharmacology. These are but isolated examples and it is sad but true that Karthick Chander Bose is an unsung hero.

1. Jain, S. and Murthy, P., *Curr. Sci.*, 2009, **97**, 266.

INDRANI BOSE

Physics Department,
Bose Institute, 93/1, APC Road,
Kolkata 700 009, India
e-mail: indrani@bosemain.boseinst.ac.in

Litmus test for assessing research performance

In a recent publication[1], the Indian Universities were ranked for research performance for five years (2004–08) based on the number of publications. Despite the year-to-year variations in ranking, it was possible to rank up to top 20 universities in India. Some universities like Delhi and Punjab maintained almost top ranks during the period, while others like Mangalore showed large differences. However, this exercise did not consider the standard of journals which published the papers. Rajagopal and Rameshkumar[2] analysed over 1450 journals, both Indian and international, whose scores (marks) were allotted by the National Academy of Agriculture Sciences (NAAS) on an accepted scale of 0.5 to 4.0, representing lowest to highest standard. It was evident that more than 65–70% of Indian journals were categorized under low to lowest ranks. A subsequent analysis with more than 1600 journals on a revised scale of 1.0 to 10 also revealed poor standard of many Indian journals published by the scientific societies and councils (unpublished).

The quality of research papers vis-à-vis journals is determined by the Science Citation Index (*SCI*), an international criterion to place the journals under high profile. Very few Indian journals find inclusion in the *SCI*, which implies that many journals are not up to international standards. The ranking of most of the universities would come down if quality parameters are strictly adhered to on the research performance. The excellence achieved by prestigious universities and IITs, IISc, BARC, TIFR was due to world recognition on the quality of research publications and not on the number. A top ranked university with more than 500 publications per year might slide down to low rank if quality parameters are applied. In terms of impact of science on society, research performance of high quality has more significance and relevance than quantitative performance.

To sum up, the litmus test for achieving top rank by any university is the overall qualitative performance with high impact factor. The world competitiveness of Indian science should be based on improved standard of Indian journals patronized by Indian scientists in large numbers with quality work. The career advancement and recruitment policies also should place emphasis on qualitative performance of researchers, without jeopardizing the number of papers.

1. Prathap, G., *Curr. Sci.*, 2009, **96**, 1561–1562.
2. Rajagopal, V. and Rameshkumar, M. P., *Curr. Sci.*, 2005, **88**, 207–208.

V. RAJAGOPAL

Flat 102, 18-4-60 Railway Colony,
Sri Paada Eurekha Residency,
Tirupati 517 501, India
e-mail: rajvel44@gmail.com

Top universities lead scientific innovation

Top universities play a crucial role in leading scientific discovery and development in the national science systems. An analysis of Nobel prize awards has revealed that top universities have led scientific innovations over the past 20 years[1] (from 1947 to 2006). MIT, Harvard, Stanford, Berkeley, Columbia and Chicago boast of three or more Nobel prize laureates over that period, which is obviously more than that of other universities. Because Nobel prizes, publications and citations are objective indicators of scientific innovation, we provide an examination of scientific output and impact at top 10 American universities (TAU10) and Chinese universities (TCU10), demonstrating their disproportionate contributions to scientific innovation. Let us suppose Harvard University, Stanford University, Yale University, Columbia University, Princeton University, MIT, Caltech, University of California–Berkeley, University of Michigan and University of Washington comprise the TAU10, and Peking (Beijing) University, Tsing Hua University, Zhejiang University, Nanjing University, Fudan University, Shanghai Jiao Tong University, University of Science and Technology of China, University of Hong Kong, Chinese University of Hong Kong and Hong Kong University of Science and Technology make up the TCU10. The TAU10 consists of seven private universities and three public universities, whereas all

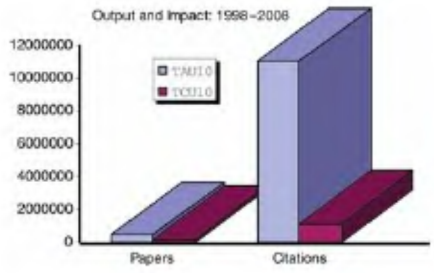

Figure 1. Output and impact of TAU10 and TCU10 during 1998–2008.

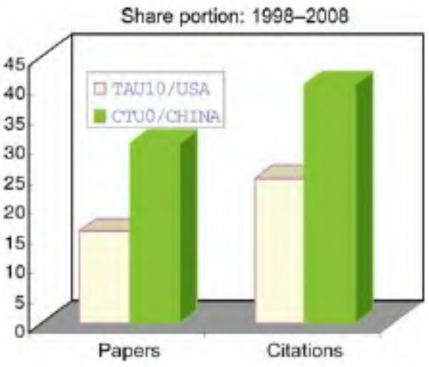

Figure 2. The share portion of TAU10 and TCU10 in USA and China during 1998–2008.

TCU10 are public institutions, including three in Hong Kong.

Although not entirely determined by them, scientific innovation can be partly measured by publication output and citation impact[3–5]. These data can be obtained from the ISI–ESI (Institute of Scientific Information–Essential Science Information) database via ISI Web of Knowledge and subsequently analysed for proof that top universities lead scientific innovation. The results are shown in Figures 1 and 2 whereas the data are given in Tables 1 and 2.

There are approximately 3000 universities in the US, but according to the data, the TAU10 accounts for nearly one-sixth of the total publications and one-fourth of total citations. Likewise, there are about 2000 universities in China, but 30% of publications and 40% of citations originated from the TCU10. Top universities contribute a disproportionately high percentage of original scientific research by the publications and citations in both US and China. These universities occupy a core position in their respective national science systems, providing crucial building blocks for both scientific research output and impact. The role of top universities in spurring scientific innovation is more evident in China, a developing country; further research could be pursued in this direction to determine if this generally holds true.

Discussions of national scientific policy should proceed with this knowledge, stimulating new ideas about how to maximize scientific discovery and development at the national level. It is worth considering the benefits of placing greater emphasis on scientific research in top universities, which may be the key to worldwide scientific innovation. Moreover, the Matthew effect in scientific publishing and R&D investing will lead to even greater attention and more interest in scientific research in top universities.

Universities are engines that drive scientific research and innovation, and top universities set the tone of their nations' scientific development through their disproportionate contributions, which may affect the national scientific policy.

Table 1. Data of TAU10 and TCU10, USA and China in ISI–ESI Database (1998–2008)

Group	Papers	Citations	CPP
TAU10	475,849	11,047,517	23.2164
TCU10	183,095	1,175,040	6.41765
USA	3,048,247	45,149,821	14.8117
China	604,041	2,920,922	4.83564

Source: http://esi.isiknowledge.com/home.cgi, 1 January 1998 to 31 December 2008.

Table 2. Portion of TAU10 and TCU10 in USA and China (%)

Portion	Papers	Citations
TAU10/USA	15.61058	24.46857
TCU10/China	30.31168	40.22839

1. Charlton, B., *Med. Hypotheses*, 2007, **68**, 931–934.
2. Craig, D. D., The centre top American research universities: an overview, The Center Reports, 2002; http://thecenter.ufl.edu
3. May, R. M., *Science*, 1997, **275**, 793–796.
4. Zuckermanm, H., *Sociol. Inquiry*, 1970, **40**, 235–257.
5. Xin, H. and Normile, D., *Science*, 2008, **319**, 148.

FRED Y. YE

Department of Information Resource Management,
Zhejiang University,
China
e-mail: yye@zju.edu.cn

Need for conservation of wetlands in arid Kachchh region

Kachchh, the second largest district in the country (45,652 sq. km), is located in the north-western region of Gujarat and stretches between 22°41′11″–24°41′47″N lat. and 68°09′46″–71°54′47″E long. The district shares its international boundary in the north and north-west with Pakistan; and the Arabian Sea lies in the west and south-west. The land area on the southern side is limited by the Gulf of Kachchh. Rajkot shares its eastern boundary, while Bananskantha, Mehsana and Rajasthan form a part of the north-eastern boundary. Administratively, this district encompasses 10 taluks with 1062 villages. Kachchh, owing to its unique ecological and geographical setting is classified under biotic province '3 A' (Kachchh desert) of biogeographic zone[1] experiencing tropical arid climate. It experiences extremes of weather conditions, characterized by three distinct seasons: winter, summer and monsoon. Kachchh receives much of its rainfall from the south-west monsoon (end of June to August). The estimated average annual rainfall from 1996 to 2006 in this