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EDITORIAL

Science in India: New Year Reflections

The new year is a time when the optimists rejoice and even pessimists look forward to a brighter future. For scientists in India, the year begins with the opening of the Science Congress, invariably on January 3, with a speech by the Prime Minister. This year's congress is the 99th in a long series. Undoubtedly, next year's congress will be special; marking a century of gatherings. In recent years, the science congress has always been long on ceremony and short on science. Public interest is limited and even scientists show little enthusiasm for a meeting which long ago lost its relevance. The Prime Minister's speech this year held out, as always, promises for a better future for science. Investments in science, which have risen steadily over the years, are slated to grow. The projection that science's share of the GDP, which is about 0.9% at present, will double over the next five years or so must surely be good news for researchers. Unfortunately, promises and projections are sometimes hard to realise and even the best of intentions can disappear without a trace in the quicksands of officialdom. Scientists in India have long bemoaned the vice like grip of bureaucracy. In many previous congresses prime ministers have promised 'debureaucratisation'; a task that is almost impossible to accomplish. This year's speech avoided the issue; tacitly accepting the fact that it is probably easier to work within an entrenched and immutable system, rather than to dissipate energies on attempting radical reform. The promise of substantial investments in scientific research will undoubtedly please the community of researchers. It remains to be seen how quickly and nimbly agencies and institutions can move in funding and executing projects. Often the process of reform and change is subverted by the glacial pace of implementation of an approved course of action. The Science and Engineering Research Board (SERB) is a good example. Announced in 2005, the SERB has emerged in 2012; the long gestation period is testimony to the remarkably inhibitory processes that set to work, whenever the status quo appears to be disturbed.

In keeping with the times, the China bogey was raised again at the Science Congress. The popular press finds a race for more Ph Ds, more publications, more money, more institutions, indeed more of everything easy to understand. Science appears now like a game, where beating an opponent or competitor is indeed a clearly definable goal. India appears to be doing much poorer than its competitors among the rapidly developing

economies, if the statistics of scientometrics are a fair measure of the health of science in India. A recent *Elsevier* report (Kolman, M., January 2012) summarises a great deal of data, captured and analysed imaginatively (I shy away from the term 'innovatively'). Using the growing *Scopus* database and an expanding set of online tools, the publishing giant seeks to inform decision makers. The new mission statement bears repetition: 'Provide information and workflow solutions that help institutional decision makers and researchers create significant value by building insights, enabling advancement and *improving research-driven returns on investment*'. This move to provide a data driven base for science policy will undoubtedly please economists and planners. Old fashioned observers of science, and I count myself amongst them, will be left mildly disturbed to see glimpses of a future where decision makers, with little feel for the uncertainties of science and its intrinsic value, pass judgements based on modern measures of science.

The *Elsevier* report merits careful reading; there is a great deal of useful and interesting information. The statistics (2010 data) that have attracted the press are of course the China-India comparisons. In terms of total published articles China (969,315) lies in second position behind the United States (2,095,934), while India (233,027) lies in tenth place. In terms of growth rate of publications (a sometimes risky parameter, which may be influenced by the growth rate in journal coverage by databases), China (22.8%) outstrips India (14.2%). Both countries show a much higher growth rate in published papers than the developed world (US 2.1%; UK 3.54%, Germany 4.71%; Japan 1.58%); a feature that is easily anticipated. There is one parameter in which India appears to edge out China. This is a number that quantitative analysts fondly believe is a reflection of 'quality', viz. citations per article (CPA). India scores 2.71, while China is close behind at 2.21, leading *The Hindu* to proclaim, 'India ahead of China in quality of scientific papers' (January 6, 2012). Using this parameter, small countries like Switzerland (7.6), The Netherlands (6.98) and Sweden (6.57) come out on top, with the United States (6.45) not very far behind. *The Hindu*'s sub-editors may have been optimistic with their headline. It would be dangerous, for example, to use overall statistics to compare the performance of Indian batting line-ups with that of their opponents on recent overseas tours to England and Australia. There is

another curious parameter that reflects the publication dates of papers cited in the reference lists of articles published from different countries. India does surprisingly poorly on this count, with only Russia doing worse. Clearly, this finding merits a closer look and may be an indicator of the nature of subjects in which papers are written. The *Elsevier* report provides an interesting view of international collaboration, a subject that merits careful strategic consideration in India. It may be critical to forge purposeful research linkages at institutional level. Little benefit may be forthcoming from the many visits of government delegations abroad, if ground level working relationships are not established by institutions. Financial resources are limited for pursuing meaningful collaboration; when they are available the impregnable wall of bureaucracy can prove inhibitory. Collaborations, both within the country and abroad, appear to be important in enhancing the quality and quantity of scientific output. Are papers and citations the most important measure of the health of the research enterprise or are we measuring what is easy to measure? Are the fields where papers accumulate quickly and journals are characterized by higher impact factors necessarily more important for investment? Will increasing the number of Ph Ds produced, by lowering and relaxing the norms of academic judgement, contribute positively to the growth of science in India? These and many other questions arise whenever a barrage of data is thrown into the arena of science policy. The *Elsevier* report begins with investment statistics that are revealing. 'India spends 1% of its GDP on research compared to 3.4% in the US and Japan.' Even more provocative for the academic science community is the fact that 'only 4% of the total R&D expenditure in India is from higher educational institutions, putting India lowest among its global peers – China (10%), Japan (14%), the US (17%) and Canada (35%)'. This statistic reflects the priorities in India where there is a great emphasis on R&D spending in the strategic sectors of atomic energy, space and defence. What is less appreciated is that areas like energy, environment and infrastructure come within the ambit of large ministries with substantial budgets, but with little or no commitment to research.

With the 12th Five Year Plan just around the corner, one might ask whether academia (and I include here the many national laboratories that do academic research, albeit in an environment distinct from an academic institution) in India can in fact digest and effectively utilise a sudden infusion of funds? Do these institutions have the administrative and financial mechanisms to benefit from the increases in budgets? Do they have the internal academic processes that permit hard judgements on areas where the money is best invested? Is the general health of the Indian academic system good enough to respond to a sudden stimulus for change? The great universities of the West, driven by an emphasis on both research and educa-

tion, have been models over the past fifty years for institutions the world over. The recent fashion of world ranking of institutions always finds the dominant universities of the West at the very top. While nostalgia might make us long for Nalanda, now an almost mythical institution, reality suggests that we might be more pragmatic and learn from more recent experiences elsewhere in the world. An observer of the Indian scene provides the view of a well-intentioned outsider, in this issue (p. 9). Richard Zare an eminent physical chemist, an ardent advocate of science education and a frequent visitor to India writes about his impressions after attending two major conferences in India in December, celebrating the International Year of Chemistry. His perceptive comment that 'there may be too much emphasis on the amount of publications as opposed to the quality' will undoubtedly be echoed by many Indian scientists. Zare outlines three criteria which young faculty need to meet in his department at Stanford in order to secure tenure. Firstly, they must be good departmental citizens. Secondly, they must be good teachers. While great teachers are most desirable, Zare notes that everyone who wants to achieve the status of a good teacher can do so. Finally, of course, faculty must be great researchers. Judgements about research are difficult to make but Zare is clear that quantitative metrics and local impressions are insufficient as a reliable guide.

The Indian academic system differs dramatically from the American model in that, with very, very few exceptions, tenure is not an issue. Faculty are invariably recruited to 'permanent positions'. Even in cases where the initial appointment is a contract of fixed term, renewals are practically automatic. Academic performance is not demanded and academic freedom often degenerates into a licence to legitimise non-performance. While the best of institutions hire faculty with some care, the majority of institutions operate under severe constraints while recruiting new faculty. There is also a vast difference between the state and central institutions, with the former being subject to considerable political pressure. Despite the many constraints and inhibitory influences, research output from India is indeed increasing both in quantity and average quality. While both the carrot and stick are used equally effectively in the West to enhance academic performance, neither is available to most institutions in India. Administrations must follow the policy of benign neglect with respect to high performers, even while turning a blind eye to the significant dead wood accumulating in our institutions. Attempts to provide incentives by the many national award schemes are unlikely to have any impact in an environment where institutions have a limited judgemental role in assessing faculty performance. One can only hope that the new year and the near future will add more good citizens, good teachers and great researchers to our institutions.

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