

CURRENT SCIENCE

Volume 88 Number 11

10 June 2005

EDITORIAL

The Winds of Change

Despite advancing age, I have never been able to give up the habit of reading the sports pages, immediately after picking up the morning newspaper. Television, with its innumerable sports channels, has only widened my interest in sporting activities, that were unheard of in my youth. Over the last few weeks I can sense the winds of change blowing over the world of sport. The men's final of the French Open tennis tournament, which I watched even as the deadline for this column slipped away, saw two new stars battling it out for the title. Rafael Nadal, fresh faced and boundlessly enthusiastic seemed to represent a new resurgence of tennis. Formula One racing, which has now acquired new meaning in India, thanks to Narain Karthikeyan, has bounced back from the seemingly monotonous and predictable string of victories by Michael Schumacher, last year. Suddenly, the reigning champion is struggling; a new king is on the horizon. In football, a star studded Real Madrid, boasting of a line-up that includes Beckham, Ronaldo and Zidane, is not even in the running for the UEFA Championship. It is only in our country's favourite sport, cricket, that change seems minimal and slow. Teams and players remain largely static; only coaches seem to make the news. Curiously, the hiring of a foreign coach appears to be the main strategy of the Indian team in preparing for the 2007 World Cup. There is an enveloping sense of tiredness, an absence of fresh and exciting prospects, as the Indian team looks at the two years ahead. However, change is not limited to the sporting arena. Economic liberalization has dramatically unshackled the economy, with many sectors expanding in an unprecedented manner. The IT boom and the prospects of a new surge in biotechnology have raised expectations of young professionals, to limits that were completely unknown. Even Ph D scientists, normally a group that struggles to find employment in industry, seem to be wanted. Multinational companies now offer salaries that scientists never dreamed of; an indicator that the winds of change are blowing stronger than ever. In considering change, I am of course constrained in this column to eschew a more elaborate analysis of sports and business and to return to science.

Are the winds of change sweeping over the world of science? A cursory scan of the literature of science over

the last few years will confirm that the international scene in science is already in the throes of a major transition. Exactly a decade ago a provocatively titled analysis highlighted the 'Lost Science in the Third World' (Gibbs, W. W., *Scientific American*, August 1995, p. 76). This well-documented study drew an uncomfortable conclusion: 'Many researchers in the developing world feel trapped in a vicious circle of neglect and – some say – prejudice by publishing barriers they claim doom good science to oblivion'. The poor status of Third World journals, prejudice in the editorial procedures of First World journals, poor communication technology and the absence of worldwide interest in many problems studied by developing country scientists were cited as factors, that seemed to conspire to consign Third World science to a world of neglect and irrelevance. China, India, Brazil and South Korea were among the countries which appeared to produce a lot of science, without any impact on the international scene. Ten years later, the pressures of international competition are even stronger; the global economy, powered by a new set of rules, demands that countries, especially the poorer ones, must raise their level of scientific and technological innovation. Almost imperceptibly, research and development has moved to the central position in any national strategy for economic progress. The responses of the most populous countries of the Third World, China and India, are now monitored closely in repeated analyses of science indicators.

China and South Korea have responded dramatically to the demand for change. As early as 1997, an analysis by the Institute for Scientific Information (ISI) revealed a doubling of Chinese publication output over the period 1989–1996 (*Nature*, 1997, **389**, 113). The Chinese output has increased substantially since then; although a citation-based analysis is less favourable (King, D. A., *Nature*, 2004, **430**, 311). The Chinese thrust has been very visible in some areas, most notably in biotechnology. The creation of large new institutes, initiation of programs to involve expatriate scientists and participation in international ventures like the human genome sequencing project have been measures that have signalled China's clear intention of competing as vigorously as possible in international science, despite an enormous starting handicap. The change of policy has

been backed by substantial state investment in the education and science and technology sectors. A recent report on health biotechnology describes the changes in China as the 'reawakening of a giant' (Zhen-Zhen, L. *et al.*, *Nature Biotechnology*, December 2004). The spurt of scientific activity in China and Korea has inspired an intriguingly titled paper: 'Are the contributions of China and Korea upsetting the world system of science?' (Leydesdorff, L. and Zhou, P., *Scientometrics*, 2005, **63**, 617). The conclusions are worth reproducing: '...The size of the increasing Chinese contribution makes this disturbance of the world system of science historically unprecedented. The exponential growth rates indicate a self-reinforcing growth pattern which is possible because of a virtually unlimited reservoir of human resources with scientific competences that seem to flow into the world system with increasing speed'. China and Korea are suddenly a scientometrician's delight. Their sudden surge of productivity make projections for the future very interesting. Will the balance of science tilt eastward? In reflecting on this question, I found an interesting perspective in an interview with the outgoing president of the US National Academy of Sciences, Bruce Alberts. In talking of the rise of science in Asia Alberts says: 'It seems likely that China or India will become the dominant scientific power. They take science and technology seriously, their young people are hungry to learn it and they have such large numbers of people. But as we all know, there are many ways to make a mess of it. My favourite example is the recent science strike in France. They want more resources for science which is good. But at the same time, you'd hope that they could adjust their system to make it more merit based. Now, after your Ph D, the first job gives you lifetime tenure. That's nuts. That's the perfect way not to run a scientific system. So I think the countries that will lead the world in science and technology are not just those with the most people. That's important. But you also need a system that allows the most talented people to have access to what they need to function effectively. Encourage the collision of ideas and reward risk-taking and innovation' (*Science*, 2005, **308**, 1108).

Does science in India feel even the hint of a gentle breeze that may be the harbinger of the winds of change? For the past several years there have been signs of a heightened awareness of the pivotal role of scientific research and technology development as key elements of a competitive economy. R&D investments in the pharmaceutical sector have risen and major research centres of multinational companies have come up in India; a sign that trained manpower might be lured away from the glamour of overseas opportunities. Change has been slower in the government sector,

although investments in science have been steadily rising over the past few years. Governments of different political persuasions have reaffirmed their commitment to enhance efforts in science and technology. There are perceptible signs of change, prompting an upbeat assessment that the brain drain may even be reversible – 'There is a silent scientific repatriation taking place in India' (Mashelkar, R. A., *Science*, 2005, **307**, 1415). I am, of course, much less optimistic. Declining scientific productivity in scientific institutions and university departments does not augur well for the future if strong corrective steps are not taken. Shoring up the base of academic science is the prime motive for two recent governmental initiatives, which have been discussed in the press. The first is the move to establish an autonomous National Science and Engineering Research Foundation (NSERF), with an estimated budget of Rs 1000 crores and a mandate to rejuvenate the academic science system in India. While critics have argued that the money might be better spent elsewhere, an assessment of existing S&T expenditure suggests that this would constitute a modest, but significant, transfusion of resources into this sector. If private participation in research were enhanced the effects could be appreciable. The second initiative is the move to establish two National Institutes for Scientific Education and Research (NISER) in Pune and Kolkata, which will begin a new experiment in integrating high quality undergraduate education in science, within the ambience of a research university. Here again critics have asked: 'Should not the resources for these institutions be channelled instead into our old and venerable universities?' This is a legitimate question, but I suspect the return on investment, in academic terms, is usually far greater in newly created institutions. Dedicated science universities may also be able to move faster in many rapidly developing areas. These new initiatives should not in any way detract from efforts to repair and reconstruct existing academic institutions. Eventually, the success of such experiments will be determined by the management structures that are evolved and the atmosphere that is created by the first generation of administrators and academicians. Can the country afford such experiments? My, admittedly prejudiced, view would be that India is at a stage, where several such experiments are necessary if we are to keep up with global trends in science. Investments alone are not enough. The new institutions must be carefully nurtured and the tendency to decline, after an initial growth phase, will have to be firmly arrested. I can't do better than quote Albert's pithy statement: 'But as we all know, there are many ways to make a mess of it.'

P. Balaram