Indian science is not short of money

The correspondence about Indian science in *Nature*[1] is today's most burning topic. This decline of Indian science has not been a one-day process but, it has occurred over a considerable period of time, possibly because of some wrong policies by our science-managers. Our Prime Minister, Manmohan Singh deserves kudos for accepting this fact at the Indian Science Congress. It is for the first time in the history of Indian science that the Prime Minister has had the courage to open the doors even for international review. Several issues have marked the downfall of Indian research, particularly in the Government-funded institutes. Some of them were indiscriminate funding towards patenting abroad[2], brain drain of young and talented scientists because of inadequate absorption policies, extravagant expenditure on duplication of research and procurement of unwanted equipment.

President A. P. J. Abdul Kalam had rightly pointed out that 20% of science budget remained unspent in 2005–06[1]. Many a times a large percentage is spent at the closing of the financial year only for the sake of spending the money.

As far as funding is concerned, India is not far behind in providing money for research and adequate facilities to its scientists. The need of the hour is to properly utilize the available funds and curtail brain drain. But who is going to check the misappropriation of this money and how? If one could see the CAG report of many scientific organizations, it would be found that instruments worth crores are gathering dust. One cannot deny the fact that many a times instruments are purchased for personal gains rather than for scientific use.

Indian science is plagued by various factors. Besides unethical practices[4,6], the urge to make illegal money, misuse of power, enhancing bio-data by frivolous publications and patents are some of the reasons for the decline of Indian science[3]. On the other hand, frustration amongst scientists because of faulty promotion policies, victimization for speaking against wrong or corrupt practices in the management, increasing sycophancy are some of the other reasons. Court cases have risen at a galloping speed in the last ten years in scientific organizations because of this victimizing attitude of bosses, and faulty rules and regulations. The problem of brain drain has already been acknowledged by all the scientists holding important positions in the country. The five-point plan by Lavania[5] to revive Indian science needs expansion. According to him, the following areas need urgent attention: (i) overhauling of university infrastructure; (ii) synergy and collaboration among national institutes without bureaucratic obstacles; (iii) project leaders to be allowed to work with complete freedom; (iv) only mature and accomplished scientists to be awarded leadership role, and (v) statutory model code for scientific values and ethics. It would be better if Lavania comes out with more practical suggestions on these issues which could be adopted by the policy makers straightway to revamp the system. We (the country) have already lost so much time.

There are many fora like CVC[7], CIC, where one can always report against corrupt practices. The Right to Information Act 2005 has been provided as an efficient tool in the hands of the common man to effectively check corruption[8]. There is no doubt that the scientific community has started taking these issues seriously and seminars and lectures are being organized to highlight these issues[9].

Anyone who speaks the truth, points towards corruption, asks for information under RTI Act is labelled anti-management and victimized by all means. It is the responsibility of the Govt and organizational chiefs to identify such persons within the system who are raising their voice against the system, listen to it and analyse it rather than just brushing it aside on the pretext of certain rules or personal whims.

However the good news seems to be that PM is going to take stringent action to protect the interests of Indian scientists and Indian science.

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Science Citation Index data: Two additional reasons against its use for administrative purposes

The fascinating and insightful debate concerning the use and misuse of *Science Citation Index* (*SCI*) data as an administrative tool[1–6] continues, with the most recent contribution from Rustum Roy[7] warning of considerable dangers associated with the frequently improper use of such data. Roy articulates well many of the major problems associated with the use of *SCI* data, of which I am in full agreement. However, I would like to mention two aspects that he does not address directly – one pertaining to the questionability of what is actually being measured by the data and the other, bearing on the deleterious effect its use may have on the progress of science.

In 1951, the US National Science Foundation was established to provide support for post-World War II scientific research. Soon thereafter, there was a proposal that reviewers of scientific proposals for government grant monies should be anonymous; the idea being that anonymity would encourage honesty in evaluation even when those reviewers might be competitors or might have vested interests. The idea of using anonymous reviewers was also rapidly adopted by many editors of scientific journals. (Prior to World War II, when a

scientist wanted to publish a paper, he/she would send it to the editor of a scholarly journal for publication and generally it would be published. A new, unpublished scientist was required to obtain the endorsement of a published scientist before submitting a manuscript.)

There is a major flaw in the blanket application of anonymity. If anonymity leads to greater truthfulness, then it could be put to great advantage in the courts. Courts have in fact utilized anonymity – in the infamous Spanish Inquisition and in virtually every totalitarian regime – and the results are always the same: People denounce others for a variety of reasons and corruption becomes rampant.

For decades, the use of anonymity within the National Science Foundation, NASA, and elsewhere has been gradually corrupting American science. Unethical reviewers – secure, camouflaged, masked and hidden through anonymity – all too often make untrue and/or pejorative statements to eliminate their professional competitors. It is a pervasive, corrupt system that encourages and rewards the darker elements of human nature. Under adverse conditions, humans adapt to their environment if they want to survive. And, survival in this corrupt environment has led to a 'consensus only' mentality. Scientists are quick to realize that citing work that challenges the 'consensus view' might well result in their own reports not being published and their proposals for grant aid receiving only lukewarm reviews. Consequently, publications of important scientific contradictions, if they can be published at all, are selectively ignored in many instances. *SCI* data in such a corrupt environment may be of little administrative value, except for possible use in documenting scientific fraud.

In the 1970s, there was a movement in American universities to make use of students' evaluations of their classroom teachers and teaching assistants. In some instances, a team would come into the classroom to collect students' evaluation forms, while the teacher and teaching assistant were required to leave the room. Those evaluations would then be analysed and used for administrative purposes, especially in promotion and tenure decisions.

People are the same worldwide. Generally, they want to earn a living and be successful and secure in doing so. From personal experience, I know the response of some teachers to students' evaluations. The teachers became less demanding, lowered their expectations, and, consequently, received more glowing reviews from many of their students. Teachers adapt and scientists adapt. As knowledge of the administrative use of *SCI* data spreads, scientists will adapt and shift to research on popular subjects to elicit greater numbers of citations, rather than take the paths less trodden where important scientific discoveries may be waiting.

Beyond the use and misuse of *SCI* data, Roy[5,7] and I[8,9] are in agreement that emerging India should chart her own course and not simply parrot a system that has been mal-administrated to the point of corruption.

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Indian science and technology at crossroads

Sen[1] has raised many issues and described the historical background in which science grew in India since independence. It is certainly of some concern to note that in the world-wide ranking, India has slipped over the years in the growth of science, when measured with *Science Citation Index* as a parameter of performance. Perhaps of even more importance, and yet to be defined by an index, is the extent to which the Indian scientific community has really contributed to the technological and economic growth of the country. One would suspect that in this regard, their contributions are even less, perhaps not entirely their fault. This is due to the fact that much of our high-technology industrial production is based on licenses from abroad. The licensors give only production technology 'know-how', and rarely the underlying design principles. Such production failed to establish a self-generating high-technology economy, in which scientists tend to play a crucial role. It is this alone that would enable us to join the cadre of the developed world.

It must be appreciated that when scientists spend public funds, they are implicitly trustees for public good, and cannot betray that trust by taking up research that does not contribute in a tangible manner to the country's welfare. If we use this criterion, one would suspect that the Indian scientific community has not really lived up to the standards set by scientists in the developed world. It is true that a lot of money is spent in the US for open-ended basic research. But when considered as percentage of the US federal budget for R&D, it is apparently not more than 15% of it. The rest of it is for directed research, technology development and R&D programmes resulting from them.

For example, when the Pentagon wanted the turbine entry temperatures of fighter aircraft jet engines to be increased by 50°C to obtain higher thrust, it supported several R&D programmes, both applied and basic. When the cooled turbine blade technology was successfully developed, all the other ongoing associated programmes were stopped. In other words, the government desired to achieve a specific technological objective, and it supported many project-specific programmes towards this end, including many in academic institutions also. This is not an isolated instance. One has to dig in deep to find similar instances in India. As the Chairman of the Technology Advisory Board (which was recently abolished) for engineering a group of laboratories of the CSIR many