Quality of science and science journals in India

Vohora and Vohora[1] are concerned about the poor quality of Indian journals. They ask why should not a country of more than a billion people and with a large infrastructure for science produce quality journals. Mere numbers cannot ensure quality in any field, especially in science. How many Indian athletes have won a gold or silver medal in the Olympics? None. Countries with less than a tenth of India's population regularly take home many Olympic medals.

Vohora and Vohora have made enquiries to the Indian National Scientific Documentation Centre and the National Institute of Science, Technology and Development Studies about improving the quality of Indian science journals (and possibly Indian science). Unfortunately, these are not the right agencies; at best their role can be peripheral. Only publishing scientists – physicists, chemists, life scientists, mathematicians, earth scientists, clinical and medical researchers, etc – can improve the quality of science.

Vohora and Vohora suggest that scientists, journal editors and learned societies should take the initiative. In fact, both the Indian National Science Academy and the Indian Academy of Sciences and NGOs such as the Chennai-based People-oriented Patriotic movement for Science and Technology (PPST) have held several meetings and discussions on improving the quality of both Indian science and Indian science journals. Many letters and commentaries have appeared in *Current Science* as well as in the pages of popular magazines such as *Science Today* and *Science Age*. What would really matter though, is the kind of science performed by Indian scientists, both as individuals and as members of a team or group or laboratory. And the quality of science performed depends on investment made, climate and ambience for research, training and a host of other factors. Above all, as astrophysicist Subrahmanyan Chandrasekhar had pointed out, it depends on the motivation and character of scientists.

Vohora and Vohora attribute the poor response to their questionnaire to 'indifference' of the Indian scientists. In sharp contrast, China, in a focused effort to improve the quality and usefulness of scientific research performed in the country, has earmarked more than a billion yuan ($ 120 million) to invite over the next five years more than 500 scientists of the rank of senior professors from reputed universities in the West to take up positions in China and work in key strategic areas. As part of this initiative, researchers belonging to the Chinese Academy of Sciences (CAS) are being urged to use their personal contacts in the West to help find suitably qualified candidates, according to the Xinhua news agency. We are told that in the past three years, about 400 overseas scientists have been brought to serve in Chinese laboratories.

Let us take an example of a journal. The American Chemical Society's *Organic Letters*, started two years ago as part of the *SPARC* initiative of the Association of Research Libraries, has recorded an impact factor higher than that of the long-established *Tetrahedron Letters*. ACS and the journal editors must have worked purposefully. Many Indian journals, published for decades, do not even find a place in *SCI* or *Journal Citation Reports* (*JCR*).

Vohora and Vohora ask whether *SCI* covers developing country journals adequately? Yes, – if a journal meets the criteria for selection, it is selected for coverage. And a journal will similarly be dropped, if it slips. The criteria for inclusion of journals in *SCI* were clearly enunciated by Garfield[2]. About 50% of journals indexed in *SCI* have an impact factor of greater than 1.0. The 47 Indian journals covered by *JCR* at one time or the other have impact factors below 0.6. It is not surprising that many other Indian journals are not covered.

Does 'ISI's monopoly' contribute to a regional bias? I don't think so. For example, when the Indian Academy of Sciences started publishing *Pramana*, the physics journal of the Academy in 1975, ISI started covering the journal in *Current Contents* right from volume 1, issue 1, and subsequently in *SCI*. More recently, the *National Medical Journal of India* was added to *SCI*, while at the same time several other journals were dropped by ISI when they failed to meet the criteria for inclusion.

Also, providing citation data is no longer a monopoly of ISI. The physics database *SPIRES*, the computer science database *ResearchIndex* founded by Steve Lawrence of NEC, Princeton, and the Chemical Abstracts Service now provide citation data, although they do not cover all of science as *SCI* does.

I share Vohora and Vohora's concern about the (ab)use of journal impact factor for deciding promotions and awards. Garfield[3] and Seglan[4], among others, have pointed out the problems when the data are used indiscriminately. Even in Great Britain, there was an outcry against improper use of 'scientometric' data in research assessment[5]. However, Oppenheim[6] has shown that the use of citation analysis in research assessment is valid. A committee appointed by the Royal Netherlands Academy of Arts and Sciences is attempting to measure the social impact of research[7,8]. There is a lesson for science policy-makers in India, where citation analysis is used indiscriminately. There is a perfectly valid role for citation analysis in India or anywhere else, if it is used properly.

Vohora and Vohora mention that most Indian researchers publish their high-quality research in foreign journals with high impact factors. Nothing can be further from the truth. How many papers from Indian laboratories have appeared in recent years in *Nature*, *Science*, *Cell*, *Proceedings of the National Academy of Sciences USA*, etc.? Precious few. Indeed I have shown that inclusion of papers from India often helps to bring down the impact factors of journals[9].

An outstanding piece of research published in a less well-known journal may go unnoticed, depriving the author of due recognition, say Vohora and Vohora. Why should anyone bury one's paper in such a journal? In any case, if someone's work is really good, sooner or later it will be known.

What worries me is that India is slipping even in quantity, as seen from *Chemical Abstracts* and the *Web of Science* (web edition of *SCI*) data. In *Chemical Abstracts*, India's share of the world's publications was 3.3% in 1982 and it has come down to 2.3% in 2000. In contrast, China's share rose from 1.8% in 1982 to 9.5% in 2000! In the *Web of Science*, India's contribution has remained steady around 18,000 papers in the past three years. Israel, a much

Table 1. Data on number of papers indexed in the *Web of Science*

Year	World	India	China	Israel
1998	958,640	17,712	19,924	12,102
1999	973,138	18,698	24,447	12,028
2000	956,412	17,501	30,501	12,271

smaller country in terms of both population and geographic area, contributes about 12,000 papers every year, about two-thirds of India's output (Table 1). China is forging ahead, while India is stagnating. If there were a bias against developing countries, the number of Chinese papers indexed in *SCI* would not have increased by more than 50% in two years.

The quality issue cannot be addressed by blaming the use of impact factors for evaluating journals or blaming ISI's monopoly. It requires a far more honest self-appraisal.

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Four-year undergraduate programme in science

There is always something happening in the education scenario in our country. Committees played around with the 11 + 1 formula and now we seem to have settled down for 10 + 2 years of education at the school level.

Undergraduate (UG) engineering education (BE/B Tech) was initially for a duration of five years. It was made into a four-year programme about 20 years ago. Similar restructuring has not taken place with science education. Chakraborty[1] has suggested a four-year UG programme in science. I fully endorse this.

As a matter of fact, an INSA–UGC Committee made this recommendation about two years ago. But nothing has happened so far. The reason, I suspect, is the dilemma, 'Who will bell the cat?' Of course, the UGC should.

As is well known, students (pushed by parents) rush into an engineering UG programme because a job is (assumed to be) guaranteed at the end of four years. It was particularly the case during the IT boom. It did not matter where and what engineering subject the student studied; the industry in India and elsewhere lapped up all of them. That explains the mushrooming of engineering colleges in the country and the trainloads (and plane loads) of students (and parents) landing in Bangalore to write the CET-2002.

There has been a dramatic decline in the number of students registering in basic science (three-year degree) courses, across the country. This is presumably because the graduates do not normally get any meaningful job at the end of three years. They have to pursue a (two years) Master's programme in the same subject or go for value addition through B Ed, MBA, MCA, etc. At the end of the Master's programme, they still do not find ready employment. They have to go for a Ph D programme to get a job in the industry or academia.

What needs to be done is to evolve a four-year integrated UG programme in science. In the first two years the students can learn mathematics, physics, chemistry and biology, and they can specialize in the subject of their choice in the third and fourth years. At the end of four years, they would be as employable as their engineering counterparts – be it for a software job or for a hardware job; be it for information technology, biotechnology or bioinformatics! They can also pursue higher studies like MBA, MCA, IAS, etc.

The change in the UG programme would increase the throughput of students in each college and save valuable resources. Many of the science colleges can combine engineering and science streams, as the IITs have done. The United States of America has been following the four-year UG programme for many years. On the lighter side, it will cost the Government of India less money to train prospective graduate students for America and other parts of the world.

Such a change in the UG programme should be accompanied by infrastructural improvement – in the laboratories, in particular. Each college should be given autonomy, whether it likes it or not. Each university department should have a four-year UG programme associated with it.

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Epilepsy, madness and creativity: The Indian ethos

The editorial 'The recesses of the mind' (*Curr. Sci.*, 2002, **82**, 1065–1066) has generated Indian academic interest in both, the nature and nurture of creativity in arts and sciences. On ordering search of 'Genius and madness', 'Google' gave a figure of 1,09,000 in 0.11 s. And not surprisingly, there is an almost total absence of citations from India. By a mere statistical probability, a nation of more than one billion people must be having its reasonable allocation of geniuses. Where are they? What are they doing? How does our education system spot them? What can be done to encourage the exceptional ones? Is our leadership – political, academic, technical, scientific – ever seized with these queries? Has the Ministry dealing with human resources ever embarked on their central issue of future progress of India? Do we have special educational facilities for our dyslexics or attention-deficit disordered children?

Epilepsy is called 'apasmara' in Ayurveda. The dancing Nataraja is shown, in all the icons, as poised on the body of apasmara-purush. Literally it means that the rhythm overcomes the dys-rhythm. Epilepsy is a consequence of an electrical dys-rhythm – a brainstorm. Madness episodes and the bursts of creativity have been correlated with epilepsy[1]. Magnetic Resonance Imaging (MRI) of the postmortem brain of Kumagusu Minakata (1867–1941), a Japanese genius, showed evidence of right hippocampal atrophy. His diary reveals evidence that he had temporal lobe epilepsy[2]. The study offers a bridge between neuroscience and classic psychopathologic approaches to the creativity of geniuses. Now there is a possibility of studying with MRI the hippocampal volumes or their discordance in size, for the right or left hemisphere in creative artists and scientists, with or without epilepsy. Even if existing hundreds of MRIs were to be screened and correlated, we may have unique Indian data on hippocampal volumes in creative persons vs cohorts.

Madness, in India, is socially much more accepted than in the Western society. The street, I live on, in Mumbai's Juhu area, has three insane persons, who are relatively well-tolerated, despite their bizarre behaviour. Freud made an early attempt to explain Leonardo da Vinci's genius in psychoanalytic concepts of narcissism, homosexuality, parenting and sublimation[3]. India, a land of so many mystics and creative persons, offers a goldmine for research in the relationship of madness – depression or schizophrenia – to mystic experiences, dreams and creativity – scientific or artistic. Steve Mizrach's article on genius or madness, wherein he discusses creativity as a hereditary flaw and a biosocial origin of genius, is worth studying in the Indian context[4]. This would particularly be relevant to facilitate creative outlets for the identified 'gifted' persons or potential genius. The role of advanced Rajayoga for its influence on the brain needs to be explored for this purpose; special powers are reported to emerge due to practice of yoga.

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Corneal blindness

Balasubramanian's article (*Curr. Sci.*, 2002, **82**, 948–957) highlighting molecular and cellular approaches for the treatment of some eye diseases was both informative and timely.

As regards corneal blindness, we are today faced with a pathetic scenario. In the city of Mumbai, with a death rate of 75,000 a year the problem seems to be twofold.

First, eye-banking is neither looked upon as a specialized medical fraternity nor as a noble function, but as a mere social cause meant only to enhance social credibility. As a result, eye-banking is controlled by politics and eye banks are run by architects, lawyers, chartered accountants and ophthalmic surgeons with vested interests. Just about anyone, except professional eye bankers.

Secondly, while the burden of eyeball collection from the deceased still remains with the eye banks, the cost of eyeball processing, surgery and hospitalization remains with the blind recipient (barring government hospitals), and yet remains termed ironically as an 'eye donation'.

As a matter of fact, the 'loudest whisper' amongst social workers and voluntary doctors is – 'Eyes are donated to whom? . . . the surgeon, the eye bank, the hospital or the recipient'.

In view of the above, utilization (corneas used for restoring vision or therapeutic treatment of the eye) of collected eyeballs in a city like Mumbai remains an abysmal 20%, thereby depriving the corneally blind of restored vision.

The Government of India has allotted a sum of Rs 500 per pair of eyeballs collected by the eye bank, but nothing towards surgery for the same.

'Eye donation' is a community effort and the number of eyeballs collected will depend on the 'accountability and transparency' of the existing eye bank, wherever it may be.

The answer therefore for corneal blindness does not lie with the eye banks, but seems to rest with the community itself.

A shining example is Dr Ramani's eye banking model in Coimbatore which has not only received recognition from the Government of India, but the blessings of poor, corneally-blind villagers for restoring their vision.

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