Future of science in India

A recent article in *Science*[1] by an eminent Indian scientist has cast a bleak and worrisome shadow over the future of basic science in India. The author is lamenting the fact that one is unable to perform cutting-edge science in India. I fully agree that every country should encourage and support basic science. But, for countries such as India, currently, this is a luxury and she cannot afford to divert much of her limited resources to this end. India needs to catch up before it can lead.

Over the past few years, India has seen some tremendous overall improvement. If progress can be quantified, then the burgeoning middle class, the prevalence of automobiles, the growth of telecommunication networks, and the increase in foreign trade all stand as clear indicators of a positive trend. The liberalization of India's markets has led to a surge in foreign investment and has increased the availability of all goods, from necessities like food to luxuries like Internet access. Indian children, who ten years ago barely recognized a telephone, today speak of computers. The job market is strong, the country seems set for political stability, and things, in India, are good getting better, not bad getting worse.

In spite of the above advancement, why has the government ignored supporting basic science? Is this our own making? For the past several decades, a select handful of Indians have dominated the Indian scientific establishment. From controlling the flow of grant money to deciding who gets awards, these individuals have held tremendous power over the Indian scientific system. Could these people be responsible for the apathy of the government, the Indian public and even younger scientists towards science?

Science is about change and young people are the ones that bring about change. There needs to be a paradigm shift, which gives more power and autonomy to young scientists. There are many good and sincere scientists in India whose interests are not motivated by awards and recognition. These people have served and will continue to serve as the mentors to future generations of Indian scientists. Science is the result of the efforts of these people, though limited resources have strained their efforts.

Two other issues addressed in the editorial call for comments. One, there is a decline in the number of students interested in science and two, more money would fix some of the problems. The decrease in the number of students pursuing science is a global trend. Future earning potential has a major role in attracting a student to a particular discipline. With time emphasis changes and one should learn to accept and work with the change. We need to do science that will create more and better jobs.

Providing a better scientific infrastructure alone may not help an Indian scientist to perform better and carry out cutting-edge research. There may be an additional factor that is unique to India that is causing most of us to work at less competitive spirit. In Western culture, society has much less influence over one's life than in India where one is always concerned about the effects of one's actions on 'what will the society do or think of me'. Considering that one cannot separate life at office from that at home, numerous Indian scientists operate with less clear mind. Such pressures do not exist, for the most part, in the West. Whose lifestyle is better is not an issue to be addressed here, but I do feel that the Western views and values in science make it more conducive to scientific research.

Progress is the result of self-sacrifice not self-interest. Let us focus on the basic issues that can be corrected by each of us, and not give up hope on the complex, but seemingly improving, system that has brought us this far. As scientists let us learn to give, not ask for more.

1. Rao, C. N. R., *Science*, 1999, **286**, 1295.

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Science in service of society: A proposal and request for suggestions

I would like to propose that we in India create a non-government, non-profit association of Indian scientists which can enable us to come together to work for the benefit of the society at large in a manner consistent with the standards we set ourselves in our professional work.

For a start I would like to suggest that we create a website, which would give unbiased accurate and frequently updated information on scientific issues which are of immediate concern to the society. This can be in medicine, gene technology, environment, energy, and a variety of other subjects. I have in mind particularly topics which are very important in the Indian context. Just to mention one example, consider the problem of drinking water which is quite acute in many parts of India for a variety of reasons; in some regions of the country there is an excess of fluorides in the groundwater, yet in some other regions arsenic compounds pose a danger and in a number of places, tannery effluents are a grave threat. It is necessary for us to make available to the public at large, the data as accurately as possible and state-of-the-art scientific solutions that are known.

I believe that it would be quite inexpensive to maintain a website by the proposed NGO and the modest financial resources that are needed would be forthcoming. What is crucial is the need for a band of committed scientists who will create this information base, and maintain it. We can start with a small number of scientific issues which we think are immediately relevant in our context. A specific area can be entrusted to a small number of people who will also take the responsibility to respond to queries from scientists, educationists, social organizations, etc. I am of the view that the proposed NGO should simply operate out of a single room in a city like Bangalore and can be supported by scientists throughout the country mostly by the electronic medium.

The membership should be open to all concerned citizens of India. Even as I write these lines, a news item has appeared that this year in Rajasthan due to further drop in the water table, drinking water has dissolved salts far in excess of permissible health limits. While it is certainly true that there are Indian scientists who understand these problems and even have answers, their expertise is perhaps either unutilized or underutilized.

I am grateful to receive your criticisms and suggestions. I can be reached by Tel: (res) 080-331 6296 (off) 080-309 2396; fax: 080-334 1683; e-mail: jpcts@cts.iisc.ernet.in

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Earthquake prediction – A distant dream

This has reference to the article by K. R. Rao (*Curr. Sci.*, 1999, **77**, 1061–1066) about a debate on earthquake prediction, conducted by *Nature* where several specialists in Earth Sciences participated. Rao's summary of the debate is very informative and useful to earth scientists. The opinion of the various experts is as diverse as the earth itself. Earthquake prediction shall remain a distant dream although earthquakes are taking place ever since the earth came into existence. Therefore their mention in the Vedas, Puranas and Epics is nothing special except that we should give them credit for faithfully recording these events which are both of chronological and historical importance.

Scientists who are now engaged in the study of earthquakes the world over, are spending their time and energy as well as their nation's money. Although their studies continue to add to the wealth of knowledge, the prediction of earthquakes continues to be a distant mirage and these quakes shall continue to cause havoc to both life and property.

One significant point in the debate made by Ian Main in the concluding remarks is '... it is not the earthquakes themselves which kill the people, it is the collapse of man-made structures which does most damage'. This statement is absolutely correct and its meaning has not been appreciated by many geo-scientists. Hence it is now appropriate to bestow a part of our attention to the design, fabrication and layout of buildings in earthquake-prone areas such as the slopes and foothills of the Himalayan belt where there is a general concentration of human habitation because of water resources, vegetation, etc. When an earthquake occurs in these areas the loss of life is more due to roof collapse of buildings. The following suggestions are made in order to reduce the loss of human lives and buildings. (1) Multi-story buildings should not be constructed, and (2) the roof of the buildings should be made of either GI sheets or AC sheets or from any other light material.

The Central Building Research Institute at Roorkee is ideally suited to undertake such studies and evolve a suitable roof which will be light weight, fairly strong and durable. These light roof materials can be easily replaced after damage by an earthquake.

Rao in his conclusion has expressed the opinion of Ian Main for designing suitable infrastructure to minimize the catastrophic impact. Rao has very aptly concluded that 'this approach to earthquake problem is more important than earthquake prediction research'.

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Global geological resource locator

With the advent of Internet and resultant development of information superhighway, accessibility to state-of-the-art knowledge has been made easy for all those who are well entrenched to face the information boom. Our country, although lagging behind during the initial period of these developments, is striving ahead and promises to become a champion of this cause.

The infrastructure development and countrywide network of scientific laboratories and universities through networking has received a shot in the arm when all the CSIR laboratories are