Funding delayed means research retarded

Scientific research is critically dependent not just on funding but also on its timely release. Whether it is the health or the science ministry, government funding agencies pay scant attention to enormously delayed disbursement of funds for approved projects. If justice delayed is justice denied, then in the case of scientific research it is 'funding delayed is research retarded'. In general, investigators receive funds 12–18 months after approval. In some instances, it could even be between 3 and 5 years.

Often project applications are promptly processed duly up to the decision stage. Peer reviewers do their bit by promptly giving evaluations. Delay sets in after this; first, in getting the minutes approved and then the actual release of funds. The inordinate delay in disbursing funds to investigators is tantamount to defying the recommendations of peer reviewers.

Approved investigators could be divided into two broad categories – new/young and the established. Quite expectedly, it is the first category that suffers the most due to delay in getting funds, most often leading to frustration. The consequences range from reduced motivation to hopelessness towards carrying out research. The long term effect of such despondency among the budding generation is facile to guess – spelling doom to their research career.

The second category, i.e. the established investigator is not quite immune to the prolonged delay in receiving funds either. Research activities of existing fellows and associates are dependent on fresh grants. The final set of experiments before a manuscript or its revised version can be submitted may very well necessitate procurement of some expensive reagents for which the grant money is important. Inordinate delay in receiving the approved grant could eventually lead to getting overtaken by international competitors – the most upsetting of all experiences that could negatively impact the morale of established and new/young investigators alike. Hence, delayed funding means impeded research.

No funding agency has perhaps considered the ill effects of such delay in receiving funds cause to investigators. Research is the most intellectually challenging endeavour. The last thing a researcher wants to do is it plead before a petty clerk for prompt attention of his/her file for release of funds. Imagine the plight of those investigators, say from Ernakulam, Silchar or Lakshadweep to go to New Delhi to convince officials in the government funding agencies that their research would generate new knowledge.

I believe the members of the task force have a pivotal role to play in addressing this issue. The members should check status of grants approved by them and any delay in release of funds should be considered as belittling the importance of research and the officials responsible should be taken to task.

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Karthick Chander Bose

The authors[1] have highlighted the seminal contributions of Gananath Sen and Karthick Chander Bose to the subject of psychopharmacology through their 'use of an alkaloid extract from the *Rauwolfia serpentina* plant' in the treatment of severe mental disorders. They point out that the observations of Sen and Bose 'are hardly known in scientific or even in psychiatric circles, and his biography or subsequent scientific career is difficult to trace'. I provide here some missing information on some of the outstanding achievements of Bose. He was a legendary medical practitioner of his time, much lauded for his ability to correctly diagnose illnesses and provide effective treatment. He was a brilliant scholar, standing first and winning all the gold medals in the final M.B. examinations of Calcutta University in 1897.

He has been variously described as the 'Father of Chemical industry in India' and 'Father of Medicinal Research in India', accolades which he richly deserved. He played a major role in the conversion of The Bengal Chemical and Pharmaceutical Works into a Public Limited Company and became its first Managing Director (1902–08). In 1908, he founded Dr Bose's Laboratory (DBL) for carrying out research on indigenous drugs and utilizing the research findings to develop and manufacture drugs. He combined the best of ayurvedic and allopathic medical traditions in his scientific research. Many of the drugs, manufactured by DBL, became household names with widespread use. In fact, DBL manufactured the Vasodil tablets, described in the literature as 'a standardized preparation for *Rauwolfia serpentina* recommended for high blood pressure, emotional disorders, nervous irritation, insanity, etc.'. Bose was a pioneer in several scientific and industrial enterprises. To give a few examples, the first machine-made tablets were made by Bose in 1909; his laboratory was the first in India to manufacture rectified spirit for the exclusive use of the pharmaceutical industry as well as many types of chemicals and disinfectants. The first private clinical and X-ray laboratories were established by Bose. His other enterprises included the founding of the Calcutta Optical Company, a sanatorium for TB patients, a sugar refinery and a soap manufacturing company.

Bose was a prolific writer and was the author of widely acclaimed books like *Official Indigenous Drugs of India* (1902), *Pharmacopeia India* (1932) and

Bharatiya Vaisajya Tattwa in Bengali and Hindi (1934). He edited and published popular health magazines like *Health and Happiness* in English, *Swasthya Samachar* in Bengali, and also the Hindi and Urdu versions of the latter. The idea was to spread health consciousness and medical knowledge among the lay public. The magazines were extensively read and praised highly by eminent personalities including Rabindranath Tagore. Bose was a much revered man during his lifetime (1873–1955). He led a simple life, was averse to publicity and worked tirelessly to fulfil his vision. National newspapers have highlighted his achievements at intervals. A street in Calcutta is named after him. His full biography exists in Bengali and articles have been written on him at different times. Goodman and Gillman mention the pioneering contributions of Sen and Bose to the general principles of psychopharmacology. These are but isolated examples and it is sad but true that Karthick Chander Bose is an unsung hero.

1. Jain, S. and Murthy, P., *Curr. Sci.*, 2009, **97**, 266.

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Litmus test for assessing research performance

In a recent publication[1], the Indian Universities were ranked for research performance for five years (2004–08) based on the number of publications. Despite the year-to-year variations in ranking, it was possible to rank up to top 20 universities in India. Some universities like Delhi and Punjab maintained almost top ranks during the period, while others like Mangalore showed large differences. However, this exercise did not consider the standard of journals which published the papers. Rajagopal and Rameshkumar[2] analysed over 1450 journals, both Indian and international, whose scores (marks) were allotted by the National Academy of Agriculture Sciences (NAAS) on an accepted scale of 0.5 to 4.0, representing lowest to highest standard. It was evident that more than 65–70% of Indian journals were categorized under low to lowest ranks. A subsequent analysis with more than 1600 journals on a revised scale of 1.0 to 10 also revealed poor standard of many Indian journals published by the scientific societies and councils (unpublished).

The quality of research papers vis-à-vis journals is determined by the Science Citation Index (*SCI*), an international criterion to place the journals under high profile. Very few Indian journals find inclusion in the *SCI*, which implies that many journals are not up to international standards. The ranking of most of the universities would come down if quality parameters are strictly adhered to on the research performance. The excellence achieved by prestigious universities and IITs, IISc, BARC, TIFR was due to world recognition on the quality of research publications and not on the number. A top ranked university with more than 500 publications per year might slide down to low rank if quality parameters are applied. In terms of impact of science on society, research performance of high quality has more significance and relevance than quantitative performance.

To sum up, the litmus test for achieving top rank by any university is the overall qualitative performance with high impact factor. The world competitiveness of Indian science should be based on improved standard of Indian journals patronized by Indian scientists in large numbers with quality work. The career advancement and recruitment policies also should place emphasis on qualitative performance of researchers, without jeopardizing the number of papers.

1. Prathap, G., *Curr. Sci.*, 2009, **96**, 1561–1562.
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Top universities lead scientific innovation

Top universities play a crucial role in leading scientific discovery and development in the national science systems. An analysis of Nobel prize awards has revealed that top universities have led scientific innovations over the past 20 years[1] (from 1947 to 2006). MIT, Harvard, Stanford, Berkeley, Columbia and Chicago boast of three or more Nobel prize laureates over that period, which is obviously more than that of other universities. Because Nobel prizes, publications and citations are objective indicators of scientific innovation, we provide an examination of scientific output and impact at top 10 American universities (TAU10) and Chinese universities (TCU10), demonstrating their disproportionate contributions to scientific innovation. Let us suppose Harvard University, Stanford University, Yale University, Columbia University, Princeton University, MIT, Caltech, University of California–Berkeley, University of Michigan and University of Washington comprise the TAU10, and Peking (Beijing) University, Tsing Hua University, Zhejiang University, Nanjing University, Fudan University, Shanghai Jiao Tong University, University of Science and Technology of China, University of Hong Kong, Chinese University of Hong Kong and Hong Kong University of Science and Technology make up the TCU10. The TAU10 consists of seven private universities and three public universities, whereas all