Structure of Indian science: suggestions on operation of competitive grants

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The state of Indian science has attracted considerable discussion. Science in the country presents a mixed picture. There is much to be proud of and there are areas of inadequate performance. The comments on our performance and the suggestions for improvement also cover a wide spectrum. Science has witnessed an increased buoyancy in India during the past decade, as evidenced, for instance, by the spurt in the scientific publications from India, substantially on account of the enhanced governmental support to the R&D sector during and after the turn of the century, which followed a dip in support during most of the nineties. It is important for us to take full advantage of this buoyancy and develop ways and means to improve the quantity and quality of scientific endeavour in the country. In this context, one of the issues that needs to be addressed, by no means the only one, has to do with the structure of Indian science.

The multi-faceted structure of science in the country has evolved over several decades. It is to a substantial degree a robust system which has, despite weaknesses, delivered. However, a feeling is gaining ground that it is not equal to the tasks of modern, globally competitive scientific research. The Prime Minister of India himself has emphasized the inadequacies of the administrative structure of Indian science in successive addresses to the Indian Science Congress. He has particularly decried excessive bureaucracy and hierarchy. Indeed, as I have mentioned elsewhere, 'in order to unleash the creative potential of Indian science, we need a vibrant, resilient and sensitive system which is less bureaucratic, less hierarchical, more autonomous and more participatory'[1]. While addressing this issue, it is important not to resort to blame-game. It is counterproductive to criticize excessively individuals or individual components of the system. In fact, many of our colleagues responsible for the management of the system deserve to be complimented on their heroic efforts to work it as well as they can. The problem is systemic. One way to approach the problem is to address sub-system by sub-system in a process of attrition. Furthermore, rhetorical statements are not of much help. Concrete, workable suggestions are called for. In this spirit, I give below a set of suggestions pertaining to the subsystem concerned with competitive grants. I have made most of these suggestions at many important fora and to administrators and policy makers at the highest level. However, I thought that it is now appropriate to present them openly before the scientific community.

Grants obtained on the basis of peer review and scientific assessment form the lifeline of modern scientific research, especially that based on individual or group initiative. India has several sources of such grants and the systems for administering them are robust. These grants have been responsible for many scientific advances in independent India. I have depended almost entirely on competitive grants for my research. I have also been involved in advising on research grants and in regulating their operation at the institutional level. The suggestions given here arise from these experiences, in addition to discussions with colleagues.

(i) In my view, the most important problem in relation to research grants has to do with release of funds. For the effective utilization of the grant, funds should be released for the duration of the project and not year by year. Funds released at the start of the project and in subsequent instalments, not only for equipment, but also for consumables, personnel, contingencies, travel, etc., should have the provision for almost automatic carry over of unspent balance without lapsing from year to year. The next instalment of funds should then be released when the already released funds are nearly exhausted. A couple of decades ago, several agencies used to follow the above practice; at least one major agency does even now, despite considerable erosion of flexibility in the intervening period. When grants are released year by year, as most agencies do now, the results are often disastrous, especially when the amounts involved are comparatively large. Only the funds for the first year arrive without difficulty. In each subsequent year, it often takes several months to process the release of funds. Then only a few months remain to spend the money. Consequently, funds often lapse or are spent inappropriately in great hurry. In the meantime, the investigator spends most of the time worrying about funds instead of science. This can be avoided, if funds are released for the duration of the project in a manner suggested earlier. This suggestion is also in consonance with a recommendation in the Report of the Steering Committee on Science and Technology for the Eleventh Five Year Plan[2].

(ii) Loss of documents and communications, and mutual recriminations for delays and inaction often occur. This can be substantially eliminated through extensive computerization, in addition to speeding up the process. It should involve an exact date-wise record of the movement of a proposal or request. The investigators, as indeed others concerned with the project, should be able to know the exact status of a proposal/project/request. This is now possible in relation to flight and train booking, application for passport, etc. It should be certainly possible to introduce such interactive computerization in granting agencies.

(iii) It should be within the power of the investigators to reappropriate funds within specific limits from one head to another. Division in terms of consumables, contingencies, etc. is anyway archaic and unrealistic. The recurring grants could be combined in one head as working expenses. Accountability should relate to the results emanating from the project and not in terms of strict adherence to the somewhat artificial divisions in the utilization of funds.

(iv) Functions of research personnel such as research associates, junior and senior research fellows, project assistants, etc. substantially overlap. The number of personnel only needs to be specified by the granting agency. Within that number and the prescribed norms, the investigator should have the freedom to choose the desired category of personnel depending upon availability and need. In major projects, provision for some organizational support is also necessary.

(v) There is great emphasis on publications in reputed journals. Publication often costs money in different ways. Even Open Access, or may I say much of

Open Access, involves expenditure. Therefore, publication charges should be an integral part of the project budget, with an appropriate sub-head.

(vi) The activities of the granting agencies have expanded manifold during the last couple of decades. The staff strength and other facilities at the agencies have not correspondingly increased. Outsourcing to private parties is not a desirable option. It is the dedicated and mature personnel in the agencies that often facilitate the smooth operation of projects. Some of the old hands have retired or would retire soon. There should be adequate provision for fresh recruitment and training. Physical facilities at the offices also merit attention.

(vii) The granting process involves three components: the advisory, the administrative and the financial. It is necessary to clearly define, after due discussion, the precise role of each component. Eventually, the three should function harmoniously and in tandem.

(viii) Each government department involved in extramural funding can explore the possibility of setting up autonomous mechanisms for handling project grants. However, the temptation to merge the mechanisms associated with different departments should be resisted. Plurality of funding sources and multiplicity of mechanisms are essential for the healthy and balanced development of science in the country.

(ix) Science is of considerable strategic importance in the emerging global scenario. It is difficult to assert that one area of science and technology is more important than the other. Therefore, the financial and administrative autonomy enjoyed by the Department of Atomic Energy and the Department of Space should be extended to all science and technology departments and ministries.

I believe that seven of the above nine suggestions could be implemented substantially within the existing framework. All that is required is the will to do so. The last two perhaps require further efforts. There would certainly be other constructive suggestions pertaining to the specific issue addressed here. All of them need to be considered carefully and acted upon. However, the urgency of action should not be lost sight of. As mentioned at the beginning, to ensure forward movement, it is important that the discourse does not turn into a blame game. We have to take everybody along to the maximum extent possible, to improve the system.

1. Vijayan, M., *Curr. Sci*., 2009, **96**, 451.
2. Report of the Steering Committee on Science and Technology for the Eleventh Five Year Plan (2007–2012), Government of India, Planning Commission, December 2006.

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Subsidies for R&D need to be rationalized

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The World Trade Organization (WTO) has brought in many changes in the thought process of practically each member country, and the developing countries had to and have to revisit themselves and familiarize with new realties of global trade and competition. Research and development (R&D) likely to be one of the major drivers of the knowledge society, finds adequate space in the schemes of WTO. Most commonly, the chapter on Trade Related Aspects of Intellectual Property Rights (TRIPS) has been at the centre stage as far as the direct influence of WTO on R&D is concerned. The issue of patents has been so captivating that policy makers of science and technology systems have not paid adequate attention to other chapters of WTO which would directly impact the R&D systems in many countries. For example, the chapters on Subsidies and Countervailing Measures (SCM), Trade in Services and Technical Barriers to Trade, will have direct bearing on the policies of many countries related to R&D.

As long-term investments in R&D are expected to lead to competitive advantage, it is viewed that this sector may be equated with other forms of investments, in which the present scheme of things are governed by norms of subsidies and countervailing measures. The essential principle is that investments by government to promote R&D should not lead to a situation of unfair competition among member countries, both in domestic and international arenas. The chapter on SCM has stipulated many norms and placed restrictions on funds provided by governments for many activities, including R&D. A subsidy shall be deemed to exist if there is a financial contribution by a government or any public body within the territory of a member, or there is any form of income or price support and a benefit is thereby conferred. A financial contribution by government would mean direct transfer of funds (grants, loans and equity infusion), potential direct transfer of funds or liabilities (e.g. loan guarantee), government revenue which is otherwise due is foregone or not collected (e.g. fiscal incentives such as tax credits), goods and services provided by the government other than infrastructure and payments made by the government to funding mechanism to carry out one or more types of function mentioned above, which would normally be vested in the government. The basic principle of restricting subsidies is to avoid injury to the domestic industry of another member and impairment of benefits accruing directly or indirectly to other members. Any subsidy which promotes or helps use of domestic over imported goods, or is tied to actual exportation or export earning is considered a prohibited subsidy meaning and it is not allowed. As R&D services become more known, frequently occurring and globally needed, these will be exported like any other services. These will then become a subject of prohibited subsidies. Similarly, if a grant provided by the government is, for example, not properly added to the price of the service or product or process emanating from the R&D, it may become a candidate for prohibited subsidy. In the context of R&D, certain subsidies would not attract any retaliatory action by another member.

Any subsidy provided for fundamental research is non-actionable. Fundamental research for this purpose means an enlargement of general scientific and technical knowledge not linked to industrial or commercial objectives. Industrial research and pre-competitive develop-