that there were 'small' scientists, barely subsisting on shoestring budgets, working in obscure basement laboratories trying to take small steps in the unravelling of nature's secrets which were of fascination and passionate interest to them, whether they were chemists, entomologists, physicians, physicists or botanists, being of no relevance. In a classic paper[2] in *Science* in the 1970s and in a monograph[3], Comroe provided the strongest argument ever made why science has to be 'free' and open-ended and by his inference, small, in order to be creative. His thesis was that coronary bypass surgery was facilitated by scientific findings by numerous but critical contributions in disparate disciplines by individual (individualistic) scientists over a period of almost a century, and did not follow a mission and big money-driven and structured effort. Another example. Boyle, Van Slyke and Sorenson were all small scientists, pursuing problems of their own interest, with a fierce focus, solutions to which eventually led us to understand the physiological basis of blood gas homeostasis and ionic balance in circulating human plasma in health and disease. Most of what we measure in diagnosis, management and prognosis of critically-ill patients in ICUs around the world today, as physical biochemical parameters, would not have been possible were it not for such unstructured small science working without a mission of solving big problems with big money.

The current frenetic chase for the golden helix and the rush for a mirage created by hyped and venture capital-driven scientific revolutions, need some moderation and calibration to sobriety. More often, these conquests are more admired on the covers of business magazines, hardly contributing to lasting scientific lexicon. Perhaps, it is time for a distinction to be evolved and drawn between the two types of sciences and let the discriminating public and professionals know which one we are dealing with and with what expectation. Crucially, the development of the big fish should not be by cannibalization or starving of the small fish, downgrading the support and recognition the latter needs. The 'real thing' is the small one, while the big one is an instrument to harvest the golden eggs.

History of science is full of examples of such natural evolution of the so-called small science generating without pre-planning and mission orientation, crucial foundations for such spectacular applications that have transformed our lives.

This is the time to look at the two, in balance and perspective and keep small science nurtured and supported. That 'invention is the mother of all necessities' as stated by Arthur Kornberg[4], may be the reality, rather than the long held belief of the reverse that 'necessity is the mother of all invention', the modified aphorism truly applicable in the big science, small science context.

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3. Comroe, J. H., Jr. *Retrospective Insights into Medical Discovery*, Von Gehr Press, Menlo Park, CA, 1977.
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Appointment of Vice-Chancellors in universities

D. K. Basa in his write up (*Curr. Sci.*, 2001, **80**, 1364) laments the poor quality of academic leadership provided by Vice-Chancellors in our universities and Directors in national research institutions, because of a faulty system of appointment and selection. He points out that the high priests of academic and scientific organizations in modern-day India succumb to political pressure and instead of confronting the political bosses to defend quality and truth like Asutosh Mukherjee, behave like chameleons and depend on political bosses.

Basa suggests the citation counts of a candidate be mandatory for an objective assessment of quality, in addition to other selection criteria of Vice-Chancellors/Directors. In pre-independence India, Vice-Chancellors of Calcutta, Bombay and Madras Universities were appointed by none other than the Governor-General of India. Asutosh Mukherjee got as many as five terms as Vice-Chancellor and was not removed even when the Secretary of Education of British India gave an adverse report against him for his nationalistic views. But in independent India, Vice-Chancellors in state-run universities are appointed by the Governors (in their capacity as Chancellors) on the recommendations of the Chief Ministers of the respective states. Hence, political interference is an inherent character of our university system. When the political leadership changes in a state, the first casualty are the Vice-Chancellors, who are either asked to resign or shown the door by other means. It happened time and again in Haryana and in some other states of India. Our universities have become hotbeds of politics and the Vice-Chancellors are obliged to play to the tunes of their political bosses. This vitiates the academic environment in the university campuses, with faculty and students pulling the strings with the involvement of political bosses. The universities are thus reduced to act as extension centres of the state government.

To improve upon the present system of appointments of Vice-Chancellors in Indian Universities, the following criteria may be followed uniformly in all state-run and central universities: (i) The term of a Vice-Chancellor should be fixed, e.g. 5 years and no further extension should be given. (ii) A panel of experts consisting of topmost academicians should be constituted, to advice the Chief Minister/Governor of a state

in matters of appointment. (iii) The University Grants Commission (UGC) should lay down selection criteria for appointment of Vice-Chancellors, to be followed by all universities funded by it. Surprisingly, there are minimum qualifications laid down for all the posts, from a peon to a professor, but there are none for the topmost post in the university. (iv) In addition to administrative experience of a candidate, the highest consideration must be given to research contributions made by him. The citation analysis may be used to determine the quality of research output. (v) There should be a mid-term review of the progress made by the university, so that the Vice-Chancellor may be made accountable for his actions. (vi) Above all, political interference should be reduced to the minimum in running the affairs of Indian universities.

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Role of funding agencies for the betterment of taxonomy

The article by Pushpangadan and Narayanan Nair (*Curr. Sci.*, 2001, **80**, 631–638) rightly addresses the poor state of a highly relevant and indispensable tool – taxonomy. The fact that we lack expertise in the field is revealed by the simple fact that most of the floras being worked out in India are based on those published by the British. Over the past fifty years, our taxonomists have not been able to publish a flora that could be used as a replacement for/compared with Hooker's or Gamble's. What they are doing is simply relocating the plants mentioned in these references from different parts of the country and creating new names, just for the purpose of enriching their bio-data. A taxonomist used to say that creation of new names and new taxonomic groups is indispensable as stability has not yet been achieved in taxonomy. Since evolution does not take place in a day or two, there is no possibility of changing the floristic characters within a short period. So this comment is indigestible.

Regarding the poor state of taxonomy, the funding agencies play a prominent role. There are numerous research institutes and university departments doing different types of taxonomic work using the funds provided by different government agencies like Ministry of Environment and Forest, DBT, ICAR, CSIR, etc. In some cases, due to lack of coordination among these agencies, the same or a closely-related problem is being run by two or more institutes using the funding provided by different agencies. For achieving stability in taxonomy, all the available floras of the world should be worked out. In order to achieve this objective, taxonomists should, for the time being, concentrate on flora that has not been exploited. Publishers of journals should also discourage relocations and rediscoveries based solely on morphological characters.

Pushpangadan and Narayanan Nair point to the fact that taxonomists need to work in a multidisciplinary manner. There is certainly a misunderstanding among the scientific people that taxonomy means morphological characters only, without incorporating aspects from other areas like cytology, biochemistry, molecular biology, etc. into the classical taxonomy, either due to lack of knowledge or for the fear of losing their identity. External morphological characters in most cases will be dynamic. We are aware that in the case of humans, morphological characters cannot solve disputed parentage. Likewise, while addressing the characters of taxa they should use all the available sources like cytology, chemistry, molecular biology, etc. This should be done in the taxonomic group of an individual institute itself. The present scenario, where multidisciplinary work is being carried out, is that it is being run by different persons in different groups. If this goes on, how can a taxonomist become an expert in understanding the plant system?

The funding agencies, instead of giving away lakhs of rupees for study of flora of vast areas, should concentrate on smaller problems like study of a single genus which incorporates all such methods by which a plant can be addressed properly. This could eventually be useful in creating a national database on our flora.

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EERC and closure of Earthquake Division of GSI

This refers to the news item 'More plans afoot for earthquake management and research' by Nirupa Sen (*Curr. Sci.*, 2001, **80**, 1095–1097). The Bureau of Indian Standards (BIS) has merged earthquake-prone zones of least and negligible significance zones I & II in the Seismic Zonation map of India. Accordingly, now India is comprised of just four seismic zones. Unfortunately, BIS has failed to publish the same till date, although it has appeared in the *Vulnerability Atlas of India*, published by Ministry of Housing and Urban Development, Government of India in 2000. District maps affected by natural hazards, i.e. earthquake, flood and cyclone over entire India are given in the