ductive suppression of the workers, though never proven[5]. It has also been speculated that stress caused by physical aggression shown by the queen may inhibit the release of reproductive hormones in subordinate colony members[5]. If this is indeed so, can the shoving behaviour of the queen towards her larger and less-related workers, described by Reeve, mediate such an effect? This probably cannot be completely ruled out as yet, although the lack of sex bias in the queen's shoving, and the fact that she frequently shoves her mates, may argue against it.

Yet another important question that arises from Reeve's work is whether the larger workers are indeed averse to exposing themselves to predators, as he expects them to be. In course of his field work, Stanton Braude had discovered that the largest non-breeding workers, who were previously thought only to defend the colony against predators or other naked mole-rats, often expose themselves to the greatest danger[6]. In their burrowing, naked mole-rats get rid of excess dirt in their tunnels by forming a chain in which several workers successively kick the soil behind them toward a surface-hole in the burrow. The final mole-rat in this sequence then kicks the dirt out in what has been called 'volcanoing'. Braude observed that larger workers often occupied that dangerous position. In fact, when such an animal falls prey to a snake, it gives a cry before getting killed alerting other colony members, who then rush forward and immediately seal off the passage to the predator. If this constitutes a regular feature of the behavioural repertoire of the larger workers, it may be necessary to question once more the motivations that have been ascribed to such individuals.

There is obviously much more to be discovered about the enigmatic naked mole-rat. And this is only the beginning. If these early studies of this unusual animal are any indication of what the future holds for us, we can possibly look forward to many more years of Kafkaesque surprise and wonder.

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COMMENTARY

Support for science in India

M. Vijayan

The most disturbing feature in Indian science during the last couple of years has been the precipitous fall in governmental support to science in terms of the quantum of funds and also in terms of the perceived importance the political leadership attaches to science. It has been reported that the investment in Research and Development in India has fallen during the last few years from 1.1 to 0.89 per cent of the Gross National Product (GNP), while it is 2 to 3 per cent in developed countries[1]. This has very adversely affected research activities in most institutions in India.

The importance of scientific and technological research in a nation's life is well recognized. Development has been almost synonymous to progress in science and technology. Even in a less advanced country like India, the positive impact of science and technology has been all pervasive. Perhaps the contribution of science and technology to the development of India has not been as good as we might have wished, but it has been very significant in many areas such as those pertaining to food, industry, defence, communications, medicine, etc. Science and technology go together and it is the synergism of the two that make development possible. At a time when all who matter swear by the rapid development of the country, it is ironic, and indeed disastrous, that support for science and technology should fall so precipitously.

The cut in support for science could not have come at a worse time. During the eighties, the support for science in India, though meagre by western standards, has been on the upswing and it has been effectively made use of by many. Indeed, in many fields, we have just about turned the

corner as far as internationally competitive research is concerned. A substantial withdrawal of support at this stage would put back the clock by several years and would have an extremely deleterious effect on Indian science.

It also turns out that, due to the changed global scenario, the transfer of critical scientific and technological know-how from the West to India is becoming more difficult than before. The western reaction to the planned procurement by ISRO of cryogenic rocket engines from Russia is just an example of the changed scenario. Therefore, it is all the more important for us to lay more emphasis on indigenous research effort. Furthermore, as Mrs Indira Gandhi indicated in her famous interview to *Nature*[2] in 1980, a strong and broad scientific base is necessary even to absorb imported technology. And science cannot be bought at will. It has to be nurtured within the country.

An impression has also gained ground that all research effort is sought to be made product-, service- or commercially-oriented. If it is true, the underlying approach is short-sighted. In any research organization, what is required is a judicious mixture of fundamental research, oriented basic research, applied research and technology. The proportion of these components would naturally vary from organization to organization. Also, the different components need not be provided the same proportion of funds from the national science budget. For example, the funds alloted for fundamental research can only be a small proportion of the total R & D budget. This, in fact, has been very true in relation to the R & D budget in India. However, a minimum critical level of support for fundamental research is absolutely essential for the balanced development of science and technology in the country and we are yet to reach that critical level in many facets of fundamental research. Even when a change is sought to be made in the role of a scientific organization or agency, which would involve a change in the proportion of the different components referred to earlier, it should be done gradually and with adequate preparation.

The precipitous fall in the support for science and the perceived governmental indifference to it are certainly disconcerting. Still more disconcerting is the reaction, rather the absence of it, of the scientific community to this development. This is in sharp contrast to the reaction of the community in the late seventies when a partial disbanding of the CSIR was proposed. Is it that we have become so preoccupied with our limited concerns as to be relatively unconcerned about larger issues? Is it that sufficient attention has not been paid to the development of a strong, independent and reasonably coherent scientific community in the country? Is there a case for sustained effort to improve our credibility among ourselves and also among others? As all concerned know, doing good science in India is often a very difficult and frustrating affair (and also rewarding when one occasionally succeeds!). However, have we scientists done all that is in our power to do, to alleviate the problems of doing science in India? Chinks in the armour are often revealed in times of adversity and we should urgently address ourselves the questions raised above and perhaps many more in order to further strengthen Indian science. That, however, should not detract us from facing up to the major crises caused by the drastic reduction in the support for science.

It is inconceivable that any modern government could be indifferent to science. In that light, it is important to remember that the reduction in support for science in India occurred at a time when the country has been passing through an unprecedented political and economic crisis. Perhaps during this period the main preoccupation of the national leadership was with crisis management which resulted in inadequate attention being paid to areas like science which naturally do not have powerful backers. It is also possible that scientists and those who are interested in science have not succeeded to a sufficient degree in orchestrating to the new leadership the importance of scientific and technological research in all round national development. Perhaps the Indian scientific community is yet to establish in full measure its credibility with the new government. In any case, it is extremely important that the scientific community now comes out in defence of science and for adequate and sustained governmental support to science. In many ways, now is the time to do so. The economy is in better shape than what it was a year ago and the government is more likely to be receptive to problems concerning science. The Prime Minister himself has given, in several public pronouncements, some indication to this effect. Furthermore, public opinion, as represented in the print media, appears to have begun to be concerned about cuts in the support for science and higher education. As the most directly affected group, it is imperative that the scientific community takes the lead in the campaign for adequate material and moral support to ensure sustained development of science and technology in India. I would like to urge different science academies and leading research institutions in the country to take the initiative for concerted action in this regard.

1. *Times of India*, Bombay edition, 8 August 1992.
2. *Nature*, 1980, **285**, 127–130.

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