ministers and their worth to the nation as perceived by the common man!)

8. The conclusion that compulsions of politicians and some scientists to exercise such options are responsible for Pokharan II is erroneous. The decision to conduct the tests was no longer the manifesto of a party, it was the mandate of the people of India, who elected them.

9. Valluri's conclusion that we started the nuclear race in south Asia is a dangerous doctrine. The environment in which we live with enemies on all sides demands that we are superior in every aspect including nuclear arms. The per capita cost in competing with us should be unaffordable for our smaller neighbours.

10. The scientists in government-funded organizations have no business to criticize national policies and their democratic rights as free citizens of the country are subject to the constraints imposed by the secrecy requirements of the sensitive projects they are handling. They should be particularly careful in commenting about things they do not know such as the foreign policy and the government policies on national security and defence. It is entirely appropriate for organizations to take disciplinary action on employees violating their conduct rules.

11. Valluri's letter amply demonstrates the fact that scientists cannot be entrusted with the task of foreign policy decisions. The complexity of the real world relationships between nations, the course of history leading to wars, the evolution of foreign policy and strategic issues concerning development, deployment of nuclear weapons and possible nuclear disarmament – all these need consideration of people specialized in these areas. Scientists paid by Government should do their job, whether it is the job of designing and testing an ICBM or a nuclear weapon. In fact, the *Bhagavad Gita*, which Valluri quotes in the context of Oppenheimer's reaction, may be used to justify the proper course of action of Indian scientists.

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Young student scientists programme

Apropos the editorial of 25 April issue of the *Current Science* (1999, **76**, 1059–1060) wherein the encouragement given to young scientists (in the age group of 32–45 years) by the various government agencies as CSIR, DBT, etc. has been highlighted to the end of which there was a cartoon by Ayan Guha in which the 'youngest scientist' award has been illustrated. In this article, I would like to communicate that the so-called youngest scientist award programme has already been implemented in the state of Tamil Nadu. The programme titled 'Young Student Scientists Programme' (YSSP) is the brainchild of the Tamil Nadu State Council for Science and Technology (TNSCST), Chennai, an autonomous organization of the Government of Tamil Nadu for the promotion of science and technology in the state.

The objective of YSSP is to inculcate scientific attitude in the minds of school children and to promote their aptitude in science so that eventually they would be motivated to choose a science-based career in their life. To implement this scheme, the TNSCST has rightly chosen pupils in schools who have completed their VIII standard, because at this age they would be amenable for shaping into any form that we desire. Their intelligence, concentration, vigour and vitality could be channelized for their positive development by putting them in the right track. The programme was first conducted at the Anna University, Chennai and Alagappa University, Karaikudi, during 1996 and 1997, respectively, and was extended to five districts in 1998. During the current year, this programme is being implemented in 15 districts and it is poised to cover all the districts in the state of Tamil Nadu from the next academic year. This programme is fully sponsored and financed by the TNSCST and the Ministry of Human Resource Development, Government of India. From each revenue district 50 students are selected (25 from schools located in rural areas and 25 from urban areas) and they are given intensive orientation in science subjects.

As the Project Director of YSSP of Madurai District, in this article I communicate the highlights of this programme. For selection of students to this programme, the officials from the Government's Education Department wrote to the principals of all schools in Madurai district asking them to nominate two top-ranking VIII standard students from their school and 313 nominations were received. The nominations were classified into rural and urban categories based on the location of the schools. The details of nominations received are presented in Table 1. An entrance test containing 100 objective type questions was administered on 21 February 1999, at The American College, Madurai, which is the nodal agency for the Madurai district for implementing the YSSP. Based only on the achievement of pupils in the entrance test, 25 students were selected each from rural and urban category. It was interesting to note that 25 boys and 25 girls had been selected. The YSSP at our centre was held between 3 May and 2 June 1999. The same batch of students will undergo orientation for two more consecutive summers.

The academic programme of YSSP is completely residential in nature. The boys and girls have been accommodated in two hostels in our campus. Their activity starts at 6 am and ends at 9 pm.

Table 1. Nomination received from various schools in the Madurai district of Tamil Nadu for the YSSP

Nominations received	Category of schools	
	Rural	Urban
Boys	88	89
Girls	65	71
Total	153	160

Between 6 and 7 am, training in yoga is imparted. Between 8.30 am and 1 pm they have four theory classes with a break of 30 minutes in between. From 2 to 5 pm they carry out practicals in the various laboratories. They are taught mathematics, physics, chemistry, biology, computer science and environmental science. In the evenings, between 7 and 8 pm special lectures are delivered by experts. The resource persons for this programme include college and university professors, leading scientists, engineers, doctors, psychiatrists and industrialists. Further, on weekends, the young student scientists are taken for visits to industries and research laboratories. They are inspired by such visits and get motivation towards science.

The TNSCST has fixed the per capita expense for the YSSP at Rs 3000 per month and in my experience this must be the highest budget allocation for education in India. However, I would say that this is definitely a worthy investment for making future scientists in India. In support of my conclusion, I present two achievements made by these students.

(i) When a mathematics professor explained to them how to work out the magic square choosing a five square example, the same evening many of them worked on it and came with magic squares of varying dimensions such as 21, 47, 55, 85 and 121. It is encouraging to note that there may be Ramanujams, Chandrasekars, Abdul Kalams and so many great scientists in these boys and girls. (ii) Another young student scientist, Babulal, approached the formulae of Archimedes in a different angle and has derived a set of formulae which his fellow young student scientists proudly christened as 'Babulal's formulae'. In these formulae, he has shown a different approach in geometry relating circumference, area and volume of circles, rectangles and squares.

Interestingly, the boys and girls who got selected from rural schools are equally inquisitive, sincere and motivated to learn newer concepts as their counterparts from the urban schools. In their performance in solving problems and application of the concepts they have learnt, only marginal difference was seen between the rural and urban young student scientists. Though the Tamil medium students initially had some problems in grasping the scientific concepts, at a later stage they themselves in the course of the YSSP expressed that language was not a barrier for them.

My contention based on my experience with the young student scientists of our centre is that if the children are given the freedom of expression paralleled with an unsuppressed inquisitiveness, they would turn out to be excellent scientists in future inasmuch as they seem to have a better reasoning power than the adults. I do not know in how many other states in our country such a programme has been launched. If this communication can be instrumental in introducing such programmes in one or two states, the purpose of this article would be served.

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Reappraisal of an ancient text on elephants

Gajashastra[1], a compendium of veterinary science of the elephant composed at an ancient though uncertain date in India, is a quotable example in the history of science. A reference in a Pali text[2] indicates that this *shastra* was well known and respectable even then and must therefore be more than 2000 years old.

We note that the reproductive phase of the female Asiatic elephant has been described in *Gajashastra* (Sloka 3, Section on *Garvinilaksmanam* or signs of pregnancy) as extending from the age of 12 to 50. This almost exactly tallies with recent data collected by the Kerala Forest Department over the last 140 years and examined by Krishnamurthy and Wemmer[3]. The earliest age in this record is 11 and the oldest is 51, leaving out a single exception which, moreover, is doubtful because the she-elephant was wild-caught and her exact age unknown. (However, a few exceptions are known from other quarters).

Since it has been proved that the factual data of *Gajashastra* (as opposed to myths and fables like those of winged elephants) are quite reliable, one can further examine some of these. For example, in the same section it is said that in the second month of pregnancy, the animal is prone to indulge in mild yawnings (*Mridu jrimbhana*). This can now be verified or disproved by undertaking hormonal tests while observing the behaviour pattern of the she-elephant in question. Again, with our present knowledge of pheromones of the elephant, it is interesting to read (Sloka 6, section on *gandhahastilakshmanam* or signs of a 'smelly elephant') that an unusually healthy (literally, wealthy) elephant particularly valuable as a war-elephant and so prized by the king, is 'endowed with a smell which resembles that of honey and its sweat, urine and dung are redolent of the same aroma' and that (Sloka 7) 'Other elephants are stimulated by such sweat, urine and dung'. All this might be the action of pheromones like cresol, farnesol, etc. of temporal gland of the male and hormones like testosterone or their breakdown products which may find their way into the blood, sweat, dung and urine. Many animals are known to leave imprints of their physiological state in excretory products. Both male and female elephants (both African and Asiatic) frequently urinate in the sexually excited stage and this urine contains pheromonal signals, the most well known being 7-dodecenyl acetate[4] in the case of the female Asiatic elephant.

On coming in season, the female (before pregnancy) flings up the tail (*balamutskhipya*) as mentioned in Sloka 10 of *Garvinilaksmanam*. *Bala* means boy, hair and, more importantly, tail[5]. Here the word undoubtedly means tail. In 1972, Krishnan wrote that such an elephant may smear the tail end (tail hair) with vaginal or anogenital secretion and then raise it like a flag[6], a fact further