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

confirmed by Ghosh[7] with two wild and one domestic female. This would facilitate the sex pheromone signals to be airborne and therefore warrants further study, especially of the volatile fraction of the secretion.

Although vaginal secretion is not mentioned in *Gajashastra*, raising of the tail is a remarkably acute observation, for, even today mahouts cannot tell whether their charges have come into season[6] and this ancient text may even now furnish leads for research.

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4. Rasmussen, L. E. I., Lee, T. D., Roelofs, W. L., Zhang, A. J. and Daves, G. D., *Nature*, 1996, **379**, 684.
5. Monnier–Williams, M., *Sanskrit–English Dictionary*, Oxford, Clarendon Press, 1899.
6. Krishnan, M., *J. Bom. Nat. Hist. Soc.*, 1972, **69**, 310.
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NEWS

Ewald Prize for G. N. Ramachandran

The Ewald Prize of the International Union of Crystallography has been awarded to G. N. Ramachandran for his outstanding contributions to the field of crystallography: in the area of anomalous scattering and its use in the solution of the phase problem, in the analysis of the structure of fibres, collagen in particular, and, foremost, for his fundamental works on the macromolecular conformation and the validation of macromolecular structures by means of the 'Ramachandran plot', which even today remains the most useful validation tool. Ramachandran, one of India's most distinguished scientists, pioneered the development of structural molecular biology and biophysics in this country.

The establishment of the Ewald Prize, for outstanding contributions to the science of crystallography, was announced in February 1986 and was given wide publicity. The name of the Prize was chosen with the kind consent of the late Paul Peter Ewald, to recognize Professor Ewald's significant contributions to the foundations of crystallography and to the founding of the International Union of Crystallography, especially his services as the President of the Provisional International Crystallographic Committee from 1946 to 1948, as the first Editor of the IUCr's publication *Acta Crystallographica* from 1948 to 1959, and as the President of the IUCr from 1960 to 1963.

The Prize consists of a medal, a certificate and an award of US $ 30,000. It is presented once every three years during the triennial International Congresses of Crystallography. The first Prize was presented during the Perth Congress, being awarded jointly to J. M. Cowley and A. F. Moodie. The second Prize was presented during the Bordeaux Congress to B. K. Vainshtein. The third Prize was presented during the Beijing Congress to N. Kato. The fourth Prize was presented to M. G. Rossmann during the Seattle Congress.

The presentation of the Ewald Prize for 1999 will be made during the Glasgow Congress Opening Ceremony on August 4.