of pests that occurs in the latter part of monsoon. The farmer has only to invest in plastic bags, costing about Rs 60 per ha and the labour of filling the bags and watering them from 15 May to 15 June. Transplanting is labour intensive, but because the number of seedlings to be transplanted per hectare is just 10,000, the labour requirement for transplanting cotton is not very high. In comparison to the directly sown crop, the farmer spends at the most about Rs 500 extra per hectare on the transplanted crop.

Demonstrations were conducted in farmers' fields in Maharashtra, during three consecutive monsoon seasons of 2000, 2001 and 2002. The transplanted plants showed greater height, earlier maturity, more branches, and more and larger bolls than the plants grown from seed directly sown into the field. The average seedcotton yield over all the three seasons and twenty plots was 1513 kg/ha in the transplanted plots as against only 828 kg/ha in the directly sown plots. The transplanted crop thus showed yield superiority of 83% over the directly sown crop.

If this technology becomes popular, farmers having a reliable source of water at their disposal can raise seedlings of cotton for selling them to others. However, seedlings in plastic bags, produced on a commercial scale, cost about paise 40 to 50 per seedling, which is too high a price for the rainfed farmer. In order to reduce the price of seedlings, experiments were conducted under this project to transplant seedlings grown on raised beds instead of in plastic bags. However, cotton plants did not survive if they were uprooted from a nursery bed and transplanted into the field. This finding emphasizes the need for breeding genotypes of cotton, which can tolerate transplanting after being uprooted from a nursery bed.

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Back to square one with 'Proteoma music'?

Were the authors aiming to become Ig Nobel laureates? A press report from Spain featured something called 'Genoma Music', how 'translated DNA code' makes for 'easy-listening music'. 'Unravel DNA's double helix, picture its components lined up like piano keys and assign a note to each. Run your finger along the keys "for fun" and record an audio version of the blueprint for life.'

'DNA, or *D*eoxyribo*N*ucleic *A*cid, is composed of long strings of nucleotides, the four nitrogen-containing bases: adenine, guanine, thymine and cytosine – A, G, T and C. A snippet of a gene might look like – AGCGTATACGAGT –.Assign tones of the seven-note *Do-Re-Mi…* scale to each letter: Thymine could become *Re*, Guanine *So*, Adenine *La* and Cytosine *Do* and convert the sequence into sheet music.

'Played solo on percussion, classical guitar or other instruments, the sequences sound cute but rudimentary. The alphabet soup of bases served as base lines to accompany melodies. "Genoma music is a way to bring science and music closer together" one of the team, a piano-playing microbiologist who specializes in fungi said. "The mood and rhythm of the underlying genetic code have influenced the melodies. One melody draws on a yeast gene known as SLT2. It features a stretch in which one triplet of nitrogen bases appears several times in rapid succession – a repetitive phenomenon that has a musical equivalent called *Obstinato*…."'

My thoughts took over as I finished paraphrasing the press report. *Time*, the weekly newsmagazine, wrote in its 31 December 1999 Millennium issue: 'Best musical innovation of the [just-about-to die] millennium: About 1040 AD, a music teacher–monk introduced a system of naming pitches to help singers learn new music: *Ut*, *Re*, *Mi*, *Fa*, *Sol*, *La*. *Ut* became *Do* later and *Ti* was tacked on to make the seven-note scale: ***do***, ***re***, ***mi***, ***fa***, ***sol***, ***la***, ***ti***.'

The *Amarakosa* [the 5th century AD, *Roget's Thesaurus* of Sanskrit] says, however:

'***Ni***shaadha***R***shabha-***Ga***andhaara-
Shadja-***Ma***dhyama-***Dh***aivataaha |
Panchamas-chaityamee ***sapta***
tantree-kanthotthithaah svaraaha ||'

'From which these seven named notes are generated on chords, vocal or taut, ***sa***, ***ri***, ***ga***, ***ma***, ***pa***, ***dh***, ***ni***'. Whence the West's claim of 'musical innovation'? 500 years too late!

One gets to know, even from newspaper clippings on the 50th anniversary of the establishment of the structure of DNA, that 'Genetic code' (*not* 'DNA code') refers to how protein synthesis is controlled by three-letter sequences. Sets of three of A, C, T and G form codons that specify the amino acids needed for protein synthesis and what to do at the 'next stage' [one more amino acid, fold the chain and get it going?].

Amino acids essential to life are twenty-two in number, they say. 'Genoma music' composers would not have stopped at merely assigning arbitrary tones of the seven-note chromatic scale to the four bases had they been aware of certain technical aspects of Indian classical music. Venkatamakhin, the 17th century author of the *Chaturdandi Prakaashikaa* ('The Illuminator of the Four Disciplines'), and his immediate successors, set down the *Melakarta raaga chakra*, a 'Periodic Table' of generative (*janaka*) *raagas*. Claiming 'all melodies, by whomsoever and wherever played, can be derived from these primary *raagas*,' the *Prakaashikaa* quotes *really* ancient Sanskrit treatises: (Wo)man was earlier able to distinguish twenty two *swaras* (notes) between the octaves. That ability was lost, present day wo(man) can distinguish only twelve *swaras* on which to build the structures of the derived melodies (the *janya raagas*). These melodies have the freedom to move their defining notes within certain ranges, allowing their *lakshanas* (flavours) to be

clearly experienced. Such little 'movements' can make the *raagas* infinite in number.

The creators of 'Genoma music' would have had a much wider field had they decided to produce 'Proteoma music' using three-letter codons that specify the twenty two amino acids, the same number of pitches the Indian Ancients were able to distinguish. What would 'Lysozyme' sound like? Being a component of 'eye water', with an ability to 'lyse' bacterial coats, would it merely produce tears? Yes, the 'music' produced may not be 'easy-listening'. Sounding like Indian classical melodic music and 'avoiding being drowned in a sea of harmony' (as Yehudi Menuhin, the great violinist put it), the composers would have gone back to square one, just where the Indian Ancients had no choice but to start at!

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NEWS

Training popular science writers in regional languages

The communication of scientific knowledge is integral to science research and essential for its continued survival. The public needs to know more about science and technology. Many researchers have difficulty in talking about their work in a way that people who are not scientists can understand. To solve this problem, society needs people with special bridging skills who can provide a link between S&T and the public. Understanding this need and realizing the role of potential popular science writers, the Gujarat Council of Science City conducted a four-day state level workshop on popular science writing, illustrations and journalism at Gujarat Science City from 28 April to 1 May 2003. The workshop was supported by National Council for Science & Technology Communication (NCSTC), Department of Science & Technology, Government of India, New Delhi. About 45 participants from all over the State of Gujarat attended the workshop.

The basic objective of the above four-day workshop was to train science teachers and science communicators about different science, technology and societal issues and how science and technology could be harnessed to solve the different complex problems in the society. The participants were trained in the basic skills in writing scientific stories, features, articles and scripts for different media like the print as well as the sophisticated electronic media.

Inaugurating the workshop on 28 April 2003, Rajesh Kishore (Secretary, Department of Science & Technology, Government of Gujarat) spoke on the importance of science and technology in daily lives. He advised the participants to be ready for a knowledge-based society, which can only be possible through effective S&T communication to a larger audience.

Science communication has two main objectives; imparting scientific information among masses and inculcating scientific temper among them, said Manoj Patairiya (NCSTC, New Delhi). According to him, scientific awareness will not only strengthen and empower the entire societal fabric, but save resources and lives too.

B. R. Sheroy (Physical Research Laboratory, Ahmedabad) spoke on the significance of the important inventions and discoveries by eminent scientists and technocrats of the country. He also spoke on the importance of the communication scientists to spread the message of the success stories to the public so that the common man can understand the process and implications of the scientific inventions.

R. K. Sahay (formerly at Council of Scientific & Industrial Research) addressed the audience about various methods of communication of S&T to the different target groups.

The participants were trained in various arts and techniques in science writing and reporting. They visited the All India Radio Station at Ahmedabad and were exposed to various facilities of the radio station and interacted with the staff members.

The participants were assigned to write an article/report/radio script/TV script, etc. as a learning exercise during the workshop and to submit the same at the end of the workshop. Whatever may be the future professions of the participants, the skills that they learnt in the training programme – accuracy, illustrations, organization, clarity, brevity and sophistication of expression – will prove valuable in the field of enhancing the science literacy programme.

Commenting on the response of the workshop, Sanjay Agarwal (GCSC) said the participants were very keen to learn to use writing techniques developed in journalism to communicate scientific and technical information, as was done by professional science writers. These individuals, once trained in both science and journalism, can translate the complex into the comprehensible for readers of daily newspapers, general magazines and specialized science magazines.

Though we have a good number of popular science writers, the number of science illustrators is very few, said Abhay Kothari who has been developing many visual compilations on science and technology with NCSTC at the national level. Illustrations have a special place in science and technology communication. The challenge of communication is perhaps the most existing aspect of illustration. It is integrally linked to words, said Kothari.

The challenge is to create science writing and reporting that matures beyond merely capitalizing on public's enthusiasm for science. It will help in generating a true public appreciation and understanding of science. We think we can do it… was the feedback of most of the participants.

As an immediate follow up to the above workshop, many of the participants are now working in science programmes of All India Radio and Doordarshan Kendra of Ahmedabad and some have begun contributing to local newspapers.

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