

### A mild joust

We are overwhelmed by the way *in vitro* flowering in bamboo has been handled (*Curr. Sci.*, 1990, 59, 346) and the boost we have received for our contribution. There are, however, a few points that need clarification. During our literature survey before October 1989 we did not find any published document regarding *in vitro* flowering and seeding (the more important aspect) in bamboo. We have carefully gone through the abstracts published at the International Bamboo Workshop in Cochin (14–18 November 1988). In the session on 'Propagation' the title of the paper presented was 'Mass propagation of bamboos from somatic embryos and their successful transfer to the forest'. Unfortunately this abstract was not printed in the abstracts booklet and the title given in reference 2 [I. V. Ramanuja Rao and I. Usha Rao, 'Tissue-culture approaches to the mass propagation and genetic improvement of bamboos'; see *Curr. Sci.*, 59, 346] appears as an afterthought. It was not our intention to suppress any published information in this regard and to claim priority for what is not due to us. We had considered this point carefully and even consulted one of the senior scientists connected with this work, who was unable to provide us with any published reference on this work.

A. F. MASCARENHAS

Divn of Biochemical Sciences  
National Chemical Laboratory  
Pune 411 008

I. V. Ramanuja Rao and I. Usha Rao reply:

The paper 'Tissue-culture approaches to the mass propagation and genetic im-

provement of bamboos', which contains the account on *in vitro* flowering, and the one referred to by Mascarenhas are two separate papers. The former was a poster presentation. The abstracts that were received late and could not be printed in the abstracts booklet (including ours) were distributed separately during the Workshop. In the paper 'Bamboo production: Imperatives and research strategies', presented at the Workshop, A. D. Krikorian and A. N. Rao also made a reference to work done at the University of Delhi on induction of flowering *in vitro*. Our work has also been seen by M. S. Swaminathan and S. Ramachandran (Secretary, Department of Biotechnology). Reference to our work on *in vitro* induction of flowering in bamboo is also given on page 22 of the 1988–89 annual report of the Department of Biotechnology. This establishes beyond doubt that *in vitro* flowering had been accomplished by us by then.

We disagree with Mascarenhas' opinion of seeding being the more important aspect. Seeding can only follow flowering and can be viewed only in that sequence as a logical outcome. Besides, there is no unequivocal evidence in their paper that seeding *in vitro* was really achieved. Two photographs of seeds of two bamboo plants do not constitute adequate and valid evidence. While, in all probability, seeding has actually been obtained by them, Mascarenhas' group will need to publish another paper with convincing evidence for seeding *in vitro*. We have observed *in vitro* flowering in both *Dendrocalamus strictus* and *Bambusa arundinacea*. However, to date, seeding has not been noticed by us. We suspect that there is self-incompatibility.

Quibbling about who first laid the egg will only cloud the fact that it is an Indian achievement. Because it might reflect poorly on the Indian scientific

community, we did not write to the editor of *Nature*, although we had strong reasons to feel unhappy that our work had been ignored by Mascarenhas, who had attended the Workshop. If we are responding to Mascarenhas' letter, it is because we respect *Current Science* as a national forum for communication among scientists.

We do recognize that Mascarenhas and coworkers have done the country proud by attracting world-wide attention. They certainly deserve to be congratulated. Their work is the first report of *in vitro* flowering in micro-propagated bamboo shoots obtained from seeds, though not the first on *in vitro* flowering in bamboo. In our work, as correctly described in the *Current Science* article, *in vitro* flowering has been obtained from somatic embryos induced in tissue culture.

I. V. RAMANUJA RAO  
I. USHA RAO

Department of Botany  
University of Delhi  
Delhi 110 007

### Greenhouse effect

With reference to the editorial article 'Modelling a meteorological muddle' (*Curr. Sci.*, 1990, 59, 391): The most important natural greenhouse gas in the atmosphere is water vapour with its complex infrared absorption spectrum; carbon dioxide comes after that. This point may not be clear to readers of the article, among whom there will be many non-meteorologists.

R. ANANTHAKRISHNAN

Indian Institute of Tropical Meteorology  
Pashan Road, NCL P.O.  
Pune 411 008

## NEWS

### Radiation safety—British study throws spanner in the works

A study on England's Sellafield nuclear plant, conducted by Martin J. Gardner (epidemiologist and medical statistician at the British Medical Research Council's Epidemiology Unit in Southampton, England), concluded that a father's

exposure to low-level radiation on the job may increase his children's risk of leukaemia. This is in contradiction to the findings of the largest ever study conducted on radiation effects—the 40-year investigation into the atomic bomb

survivors in Hiroshima and Nagasaki, which concluded that the risk of genetic effects from radiation is lower than previously believed. Gardner's study was published in the 17 February issue of the *British Medical Journal*.

According to Leslie Roberts in *Science* (248, 24; April 6, 1990), debate is raging over Gardner's study, because, if Gardner is right, radiation safety standards may have to be changed. In the dispute over the Sellafield study, one fact

### Measuring radiation doses

The effect of radiation is described in terms of two quantities. The **absorbed dose** is the amount of radiation energy that is absorbed per unit mass (gram) of body tissue. The SI unit of absorbed dose is the **gray** (Gy). This replaces the earlier rad (for radiation absorbed dose, 1 Gy=100 rad). The **dose equivalent** is a physiological quantity depending on a biological weighting factor. The weighting takes into account different types of ionizing radiation and their energies, because these may have very different biological effects. The SI unit of dose equivalent is the **sievert** (Sv). It replaces the earlier rem (for Röntgen equivalent of man, 1 Sv=100 rem). The gray and the sievert are dimensionally equivalent and are both equal to joule per kilogram. Although, for most practical applications, the weighting is unity, two separate measures are used in order to emphasize the distinction between absorbed dose and dose equivalent.

Sometimes the dose equivalent is weighted to take into account the sensitivity of different human organs/tissues to radiation exposure. This is called **effective dose equivalent** and is also expressed in sievert, or its submultiples, such as the **millisievert** (mSv).

The effective dose equivalent to a group of persons from a source of radiation is called **collective effective dose equivalent**. It is expressed in a unit called **person-sievert**. In practice, it is usually expressed as a rate, e.g. person-sieverts per year.

appears clear—there is an unexpectedly high incidence of childhood leukaemia in the village of Seascale in northwestern England, where the Sellafield nuclear reprocessing plant is located. Similar leukaemia clusters have been found near the Dounreay reprocessing plant in Scotland and the Ministry of Defence weapons labs at Aldermaston and Burghfield.

Gardner and his colleagues culled birth and medical records, and, when possible, reanalysed pathological specimens. They identified 74 cases of childhood leukaemia and non-Hodgkin's lymphoma, diagnosed between 1950 and 1985, in the country of West Cumbria, and matched them with 1001 controls. They then investigated four possible causes—prenatal X-rays, viral illness in the mother, anything that might enhance environmental radiation exposures, and parental occupation and exposure to radiation. The only one that stood out strongly was the father's employment at the plant, and, especially, his radiation dose before his child's conception. Children whose fathers were exposed to the highest levels of external radiation—either a total dose of 100 millisieverts, typically accumulated over about 6 or 7 years, or 10 millisieverts in the 6 months before conception—were six to eight times more likely to develop leukaemia than were the controls.

Researchers ask why genetic effects should show up in the children of the Sellafield workers, whose highest doses were about 10 or 20 millisieverts, when they don't show up in the children of Japanese survivors, whose average exposure was 450 millisieverts. Gardner's view is that the Japanese exposure was very different from a work situation. He speculates that perhaps DNA can repair itself after an instantaneous exposure, like that in Japan, but not in the face of continuous, low-level exposure.

According to the article in *Science*, Warren Sinclair, director of the US National Council on Radiation Protection and Measurements, does not propose to take any hasty action until more data are collected.

Meanwhile, at the Sellafield plant,

British Nuclear Fuels, which runs the plant, has announced that any worker who is alarmed about his exposure can, after counselling, be transferred to another job. Several have talked to the managers about the risk, but none has decided to be transferred.

### Dental identification disks

Forensic dentistry has developed into a reliable scientific system as an aid in identification. Among the organs of the body, teeth are the last to be destroyed under any adverse circumstances since they are highly calcified to resist putrefaction. In many criminal assault cases, evidence based on correlation of the arrangement of teeth in suspect/victim with bite marks has been produced and accepted. Availability of dental records of individuals has greatly aided identification of disaster victims. The age of an individual can be computed from an examination of the teeth.

Very recently personalized identification disks were developed, which, when bonded to teeth, help in the identification of individuals in case of disaster or mishap. The disk carries a number, which, when referred to a data bank, can provide details about the individual. The identification disk is bonded to the buccal surface of the maxillary first or second molar. It is placed above the height of contour toward the midline of the tooth; this places the disk in a stress-free area of the mouth. The selected tooth is first isolated for etching. The entire buccal surface is etched for 60 seconds with etching gel containing 30% phosphoric acid. It is then washed for 15 seconds. A small amount of a resin is applied on the etched surface, which looks chalky white in colour. The resin is also applied on the back of the disk, which is then placed on the prepared tooth surface. The disk is completely covered with the transparent resin, which is then polymerized to harden it.

A. Parameswaran, Madras Dental College, Madras 600 003.