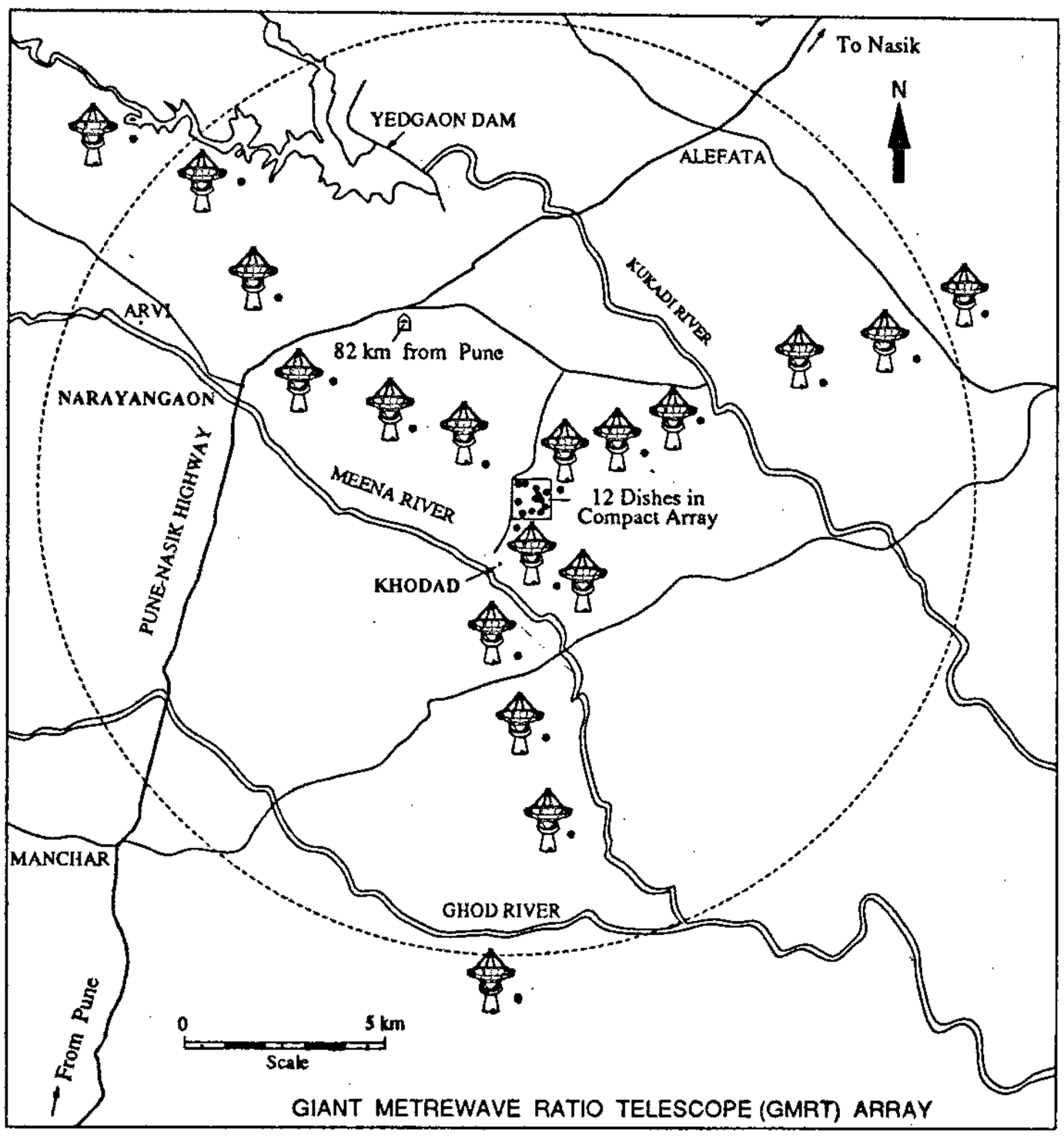

GIANT METREWAVE RATIO TELESCOPE (GMRT) ARRAY

than a million million suns, takes place in a tiny region at the centre of a galaxy that could in some cases be no bigger than our solar system). Naturally, these objects came in for discussion. So did the pulsars, representing the last stand that matter can take in the form of neutrons packed more closely than even in the nucleus, before the ultimate victory of gravity to form a black hole.

The impression that an outside observer gained from the presentations at this meeting was that on the one hand, there was a mature group of potential scientific users in the country. But on the other hand, significant technical challenges remain to be faced, and when they are, the instrument could support a community of scientific users an order of magnitude larger than that gathered at this meeting. The challenge of building up such a community had been anticipated by Swarup a decade back, but his visionary schemes have yet to come to full fruition. Such are the prospects as well as the challenges of the Giant Metre-Wavelength Radio Telescope.

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A report on the national seminar on 'Changing Scenario in Plant Sciences'

A national seminar on 'Changing Scenario in Plant Sciences' was organized at the Department of Botany, Banaras Hindu University from 13 to 14 October 1995 by J. S. Singh and V. S. Jaiswal. The papers presented in the seminar reflected how Indian botanists have caught up with the newer techniques to understand some of the basic problems in plant sciences and how they have used newer tools in realizing the potential of plant biotechnology. The seminar was memorable and a unique event for it provided a platform for plant scientists to felicitate Prof. H. Y. Mohan Ram, one of the outstanding botanists of this country, having made significant contributions in the area of physiology of flowering, sex expression, reproduction in aquatic angiosperms, morphogenesis and micropropagation. Spread over three days to cover eleven sessions and about thirty speakers, the topics ranged from single cell to tree biology. At the felicitation function N. S. Rangaswamy, convener of the felicitation committee, presented a scroll to Mohan Ram and also very fondly recounted the role of Dr (Mrs) Manasi Ram in Professor Mohan Ram's long journey of fathoming the botanical knowledge. Mohan Ram was also presented a Commemoration Volume containing 30 articles of distinguished plant scientists. Present on the occasion were a galaxy of Indian scientists, friends and admirers of Mohan Ram. The papers presented in this seminar brought out some of the newer areas where Indian scientists have undertaken research and where more input is required. Mohan Ram who sat through all the sessions expressed in the end that he got 'freshness in Indian plant science' after hearing the presentations. A report on the papers presented is briefly summarized here.

Molecular basis of developmental, physiological and cytological processes

M. M. Johri (TIFR, Bombay) gave an inspiring lecture on developmental patterns and differentiation and showed that

plants have supracellular organization where a group of cells determine the fate of a domain. This is probably achieved by cell–cell communication via plasmodesmata. The recently published electron microscopic pictures have shown that endoplasmic reticulum is connected through plasmodesmata between cells and messenger molecules like diacylglycerol and inositol tris phosphates (IP_3) can pass through and even viruses can travel across these connections. A. K. Tyagi (Univ. of Delhi, South Campus) presented his recent data on light perception in plants. It is known that photoperception is achieved through a battery of photoreceptors of which phytochrome has been well studied. Tyagi's work is aimed at understanding the mechanism of phytochrome regulation of gene expression. His work shows that light control is a sort of fine tuning exerted over the developmental-dependent changes in gene expression. Recently, it has been shown that potential phytochrome signal transduction pathway components include G proteins, Ca^{2+} calmodulin and cyclic GMP. Evidence for diacylglycerol-mediated signalling via protein kinase C in light-mediated gene expression was presented with respect to positive regulations of nitrate reductase and negative regulation of phytochrome (Sopory, JNU, New Delhi). Use of mutants to analyse the components of signal perception and transduction was demonstrated by Khurana (Univ. of Delhi, South Campus).

U. C. Biswal (Univ. of Sambalpur, Sambalpur) showed that light-mediated photoinhibition during senescence involves D1 protein, an important component of photosystem II, which gets structurally destabilized. This probably occurs due to highly oxidized P_{680} and singlet O_2 production.

Limitations on genome analysis in plants were demonstrated using case studies within family Triticeae by P. K. Gupta (Meerut Univ., Meerut). Raghuvanshi (Botany Dept, Lucknow Univ.) showed the present status of B-chromosome and its importance.

Plant tissue culture, genetic transformation, biotechnology

It has now been made possible to use synthetic *cry* gene for obtaining high expression of BT-toxin in transgenic rice plants (Sen, Bose Institute, Calcutta). These synthetic genes have been given to DBT for use by other workers. Rakesh Tuli (NBRI, Lucknow) gave an overview of his experiments with *cry* gene transformation. It seems that use of matrix attachment regions to promoters yields less variation in the expression of transferred gene in transgenic plants. Krishnamurthy (NCL, Pune) gave a crisp account of his success in obtaining transgenic chickpea plants. The group of Jaiswal (BHU) presented posters highlighting their achievement in standardizing protocols for getting somatic embryogenesis in mango. Success was reported for tissue culture of coconut by Iyer (CPCRI, Kasargod), normally a difficult material to work with. Chandel (NBPGR, Delhi) discussed the levels and conservation of biodiversity and emphasized on the use of tissue culture technique in conservation of biodiversity. He highlighted the importance of germplasm conservation both *in situ* and *ex situ*. It was revealing to note that developed countries hold about 53% and developing countries 36% of the germplasm with most of the important germplasm being held by developed countries. Shivanna (Univ. of Delhi, Delhi) presented data to show how genetic variability could be obtained by wide hybridization studies.

Stress biology

Although many laboratories are working on stress physiology and molecular basis of stress-susceptibility and tolerance, only one paper was presented (M. Uday Kumar, UAS, Bangalore). He has used dual isotopic discrimination technique for evaluating water use efficiency and showed that this could be used to check for genotypes with maximum efficiency.

Plant–pathogen interaction

R. P. Purkaystha (Botany Dept, Calcutta Univ.) gave an overview of plant–fungal interactions and defense mechanisms adopted by plants. He described a method for screening disease resistance in germplasm. D. J. Bagyaraj (UAS, Bangalore) brought out the important role of mycorrhiza in the control of nematodes and also for better drought tolerance. He showed that though there is no host-specificity, yet there is host preference. Raman (Entomology Inst., Madras) talked about insect–pathogen interaction and gall formation and argued that some indole compounds serve as stimulators.

Ecology/behaviour/biodiversity

A very prickly talk was given by Dr Rao (NBRI, Lucknow) who along with others brought out the fact that under the influence of modern trends the taxonomists are getting a rough-deal. It is true that very few are interested to pursue taxonomy. This will have repercussions in future as more and more emphasis will be laid on biodiversity. J. S. Singh and his group (Botany Dept, BHU) displayed a number of posters where they presented the relationships between structure and functioning of dry tropical ecosystems and brought out the exciting story of how they could reclaim areas declared unfit for plant growth. By identifying various species which could grow in such environment, a lot of unutilized area could be reclaimed for growing vegetation. Similarly Rai's group (Botany Dept, BHU) had also put up posters related to phytoremediation.

Two interesting talks were presented by K. N. Ganeshaiah and R. Uma Shaanker (UAS, Bangalore) on certain sociobiological concepts as applicable to the reproductive features in plants. Especially the concept of self-organized asymmetry, sibling rivalry and parent–offspring conflict were well illustrated using examples from plants.

M. V. M. Meher-Homji (Institute Francais, Pondicherry) talked about the importance of palynology in monitoring environment.

Tree biology

Tuli (NBRI, Lucknow) showed data from Sane's and his group regarding chloroplast genome analysis of populus tree. Dogra (Forest Res. Inst., Dehradun) recounted the vast genetic resources of trees and Singh (Kumaoun Univ., Nainital) discussed the differences in leaf properties between gymnosperms and angiosperms and gave experimental evidence to show that gymnosperms can grow better compared to angiosperms in certain soils which may not be very rich in nitrogenous compounds. Nayar (Univ. Delhi) showed various features of vessels in Indian woods and simple yet exciting data was presented by Dayanandan (Christian College, Madras) to show that in monocots

the major water movement occurs through main vein. In minor veins, water cannot rise vertically except for short distances but can traverse to mesophyll cells. An impressive account of reproductive behaviour and other aspects of coconut tree were also presented by Iyer (CPCRI, Kasargod).

Another feature of the seminar was an evening lecture by R. B. Singh (Director, IARI) who put before plants scientists the challenges for future. Mohan Ram gave a special lecture on Changing Scenario in Plant Sciences. According to him, the science changes not merely by observing but by questioning and attempting to unravel the mysteries and in developmental botany, problems related to embryology, flowering, apomixis, will have to be solved using newer molecular techniques. Other avenues that will need attention of botanists in future, according to Ram, are the defense mechanisms and utilization of more plants for other needs.

Overall the seminar was well conceived and well executed by the organizers. The proceedings of the seminar reassured that the young botanists bubbling with curiosity will bring about a change in research and teaching in botany in this country—a change that will also be catalysed by persons such as Mohan Ram – and those who have concern for the society and are willing to accept newer approaches.

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OPINION

Biotechnology: What's in a name

A. S. Rao

Who is a biotechnologist?

While for example every department of chemistry or physics in the country is headed by people who are formally qualified in their respective subjects, i.e., M Sc (chemistry or physics) and Ph D (chemistry or physics), no department of biotechnology in this country is headed by a person who has formal qualifications in biotechnology. Not just the leader, even the rest of the faculty do not possess formal qualifications even at M Sc level, though we had been rolling out M Sc (Biotech) students since 1987. The leaders and the faculty of the biotechnology departments in this country come from an incredibly large number of backgrounds. (I wonder whether those with biotechnology degrees would one day head other science departments.) Can this randomly assorted faculty deliver the goods?

In a medical college, the MBBS programme has so many subjects: anatomy, medicine, ophthalmology, etc. These subjects are taught by persons who have relevant qualifications in their respective subjects. Imagine a situation, when a single person teaches all the above subjects and evaluating the candidates! Is it not the situation in biotechnology departments in the country? (A typical M Sc (Biotech) programme consists of courses drawn from several major disciplines. Some of these disciplines, even have full fledged two-year M Sc programmes. I do not know how an M Sc (Biotech), compares *vis-à-vis* these students in these disciplines.)

When biotechnology has been projected as something to change the destiny of the nations, is it not necessary to ensure the desirable number and kind of faculty and, of course, the funding, to ensure biotechnology teaching and research programmes, of the desired quality? As mentioned above, the faculty constitutes a random assortment from a large number of backgrounds and their number also varies from one biotechnology department to another. And the variation in the amount of money spent on a biotechnology student and research programmes is tremendous, at several places in the country.

Moreover, what is the relevance of biotechnology departments, if the number of 'biotechnologists' outside the biotechnology departments far outnumber those within? As my observation goes, for every one faculty member in a biotechnology department, we have any where from 5 to 100 biotechnologists outside the biotechnology department, in the same institute! So, what is the relevance of a biotechnology department with so many fierce claimants from outside? Would it not be better if we bring them all together under one roof. (But, their number is so large that we may have to start separate institute/universities of biotechnology to accommodate them.)

In my opinion (a safe bet), India has the largest number of biotechnologists in the world. That is precisely the reason, why, in spite of the immense importance attached to 'biotechnology', we don't have an Association of Biotechnologists of India, the way we have SBC(I), AMI, etc. Can one imagine the Association of Biotechnologists of India, in case it is started? It would be like an Indian electorate. Electoral arithmetic and vote banks will be its keywords. There would be an immense diversity of groups: botanists/zoologists/physiologists/biochemists/geneticists/morphologists/taxonomists, etc. turned biotechnologists. We have dry weight (read biomass) estimators, enzyme estimators, effectors (those who see the effect of so many things on so many things), leaf area and root length measurers, etc. Of course, gel runners, ELISA readers, callus formers (I mean up to callus formation only), organogenesisers (thanks to Murashige and Skoog), *in vitro* fertilizers, embryo transfers, etc. Lastly, but not the least, gene cloners and sequencers (don't ask how many genes have been cloned and how many kilobase pairs of DNA have been sequenced till now and how this compares with the rate of gene cloning and sequencing elsewhere in the world). It is simply impossible to list out all the factions. One can imagine the functioning of this association.

Why is there this large-scale conversion and/or exodus of people (by all possible