In so far as the private sector in-house R&D units including state public/joint sector undertakings as recognized by the Department of Scientific & Industrial Research are concerned, Maharashtra tops the tally with 398 units followed by Tamil Nadu (122), West Bengal (103) and Delhi (101).

As regards the academic sector, i.e. universities, deemed universities and institutes of national importance, Delhi has the distinction of having 11 such places where R&D has a major role to play through various medical colleges, engineering colleges, science departments, etc., in the overall nation-building programme. These are the Delhi University, Indira Gandhi National Open University, Jawaharlal Nehru University, Indian Agricultural Research Institute (IARI), Jamia Hamdard, Jamia Millia Islamia, National Museum Institute of History of Art Conservation and Museology, School of Planning and Architecture, Shri Lal Bahadur Shastri Rastriya Sanskrit Vidyapeeth, All India Institute of Medical Sciences and Indian Institute of Technology (IIT).

A similar trend is available in the case of scientific periodicals. In fact the tremendous growth in organized science of the post-independence era could easily be noticed by taking an account of the number of scientific and technical periodicals currently published in India. There were hardly 140 periodicals existing prior to 1947, whereas the current figure is a whopping 1991. These data are contained in the latest directory of Indian scientific periodicals[2], brought out by the New Delhi-based outfit of the Council of Scientific & Industrial Research—the Indian National Scientific Documentation Centre, popularly known as INSDOC. It is once again, as expected, the city of Delhi which brings out the maximum number of periodicals, 495, followed by Maharashtra (328) and UP (258). Our industrial strength is revealed by the 630 (31.6%) titles belonging to engineering and technology and the strong agricultural base by 327 titles. The third largest category of journals numbering 297, however, belongs to medicine.

Delhi is really proud of having both the National Science Library and the National Medical Library. Time is not far off when the excellent libraries of, say for instance, the IARI may be declared in the near future as the National Agriculture Library and similarly the IIT one as the National Technology and Engineering Library.

Besides these, several international, foreign and UN agencies like the South-East Asia Regional Office of the World Health Organization and *n* number of NGOs are actively engaged in this R&D endeavour in one way or the other.

1. Anonymous, *Directory of R&D Institutions 1992*, Department of Science & Technology, Ministry of Science & Technology, New Delhi, 1992, pp. 5–26, 53–58, 61–104, 107–113.
2. *Directory of Indian Scientific Periodicals 1992* (Compilation: Joseph, A., Bhatnagar, I. M. S., Katin, K. L., Ramachandran, M., Pal, R. B., Saxena, S. K., Dhami, Sawita, Singh, Sube, Kumari, Sudershan and Rajalakshmi, V.), Indian National Scientific Documentation Centre, CSIR, New Delhi, 1992.

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Brainstorming session on development and differentiation in plants—cellular and molecular aspects

Plant developmental biology is the study of how a single cell gives rise to the entire plant with all its different cell types, tissue and organs which function in an integrated way. The overall plant development is regulated by hormones, nutrients and environmental factors. Much of the earlier work in this area was of descriptive nature. However, during the past few years with the advent of several new techniques, the molecular mechanisms of the ultimate basis of development of form and function in plants are beginning to emerge and major advances in our understanding of regulation of gene expression and mechanism of hormone action, are occurring.

Recognizing its importance, 'development and differentiation in plants' was identified as a challenging area by the Department of Science & Technology. The Programme Advisory Committee on Plant Sciences has organized a series of brainstorming sessions (*see Curr. Sci.*, 1992, **63**, 112–114 and 1993, **64**, 161–162) in order to formulate specific measures for encouraging scientists to take up research in the identified challenging areas and to help in evolving meaningful projects.

A brainstorming session entitled 'Development and differentiation in plants—cellular and molecular aspects' was organized at the Indian Institute of Science, Bangalore between October 29 and 31, 1991 under the Chairmanship of Prof. M. M. Johri, Tata Institute of Fundamental Research, Bombay.

In his keynote address, Johri summarized some of the contemporary ideas, concepts and techniques that have drawn increasing attention in recent times. He also discussed the role of developmental biology not only in basic research but also in agriculture and biotechnology.

Lead talks on various aspects of development and differentiation were given by experts. N. S. Rangaswamy presented a comparative account of the subcellular structure of seed embryos, somatic embryos and pollen embryos. The embryogeny *ex ovulo* is highly plastic and is greatly influenced by the milieu. V. Jagannathan gave a detailed account of the biochemical and mole-

cular aspects of differentiation in plants and pointed out that research on genetically induced nuclear male sterility and apomixis will be of considerable importance for plant breeding. H. Y. Mohan Ram described how the generally accepted patterns of embryo development have become modified in members of Podostemaceae. S. Mahadevan summarized the current understanding of differentiation and growth patterns in the non-chlorophyllous, leafless and rootless parasitic twiner *Cuscuta*. Sipra Guha Mukherjee reviewed the biochemical studies on the transition of cells from the proliferative to differentiative phase.

Usha Vijayaraghavan and J. P. Khurana summarized the attractive features of *Arabidopsis* and illustrated how this genetically amendable system is being employed to isolate developmental mutants and to clone the genes regulating flowering and photomorphogenesis. A. K. Tyagi discussed the expression of chloroplast and nuclear genes encoding for thylakoid proteins. R. Maheshwari and V. Nanjundiah reviewed the current ideas in the fields of differentiation and morphogenesis in fungi.

Pre-proposals invited from mid-career and young scientists were also presented and discussed in detail with the experts helping in focusing the ideas into meaningful projects.

The following general recommendations were made:

- Research on all aspects of development and differentiation is needed in a variety of plant species irrespective of their immediate application.
- Organizing of training workshops for teaching new technologies to young scientists.
- Research extension facilities to scientists who have developed model systems.
- Promote production of equipment and biochemicals indigenously.

The following aspects were recommended as focal points for intensive studies:

1. Development, differentiation and transformation studies including isolation, characterization and expression of genes controlling developmental patterns, development of somatic and pollen embryos, production of synthetic seeds, land-to-lab transfer technology, regeneration of forage crops, tree species and scientifically interesting or endangered plants and transfer of species declared recalcitrant for organogenesis.
2. Biochemical changes and gene expression including study of form and patterns, identification of genes regulating development, characterization of regulatory proteins and RFLP mapping of selected species.
3. Signal perception and transduction including characterization of receptors for hormone and other stimuli, regulation of hormone levels, transport pathways, role of various components in signal transduction and processes such as flowering, pathogenesis, thermogenesis, etc., and endogenous rhythms and clocks in plants and their molecular basis.

Decisions on the pre-proposals have been taken separately and communicated to the scientists. A comprehensive report on the brainstorming session giving detailed recommendations has been brought out by the Department of Science & Technology and can be obtained on request.

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RESEARCH NEWS

Imprintor gene identified

Vani Brahmachari

'Imprinting' was a term used by Helen Crouse to describe the selective elimination of paternal chromosomes that occurs in the dipteran insect *Sciara*. Since *Sciara* appears to have the ability to distinguish between homologous chromosomes on the basis of their parental origin, Crouse thought that the phenomenon indicated a memory effect: whence the word imprinting (originally used by ethologists to describe the long-lasting effect on behaviour of a brief exposure to a stimulus early in life). In the early seventies Spencer Brown and Sharat Chandra extended the concept of genomic imprinting to mammalian genetics while discussing the inactivation of one of the two X-chromosomes in each somatic cell of a mammalian female, as also the selective inactivation of paternal chromosomes in male coccids. Brown and Chandra also raised the possibility of autosomal imprinting in mammals and, on theoretical grounds made a distinction between genes which are sensitive to parental origin and those which actually exhibit differential behaviour such as inactivation. Selective activation or inactivation dependent on the sex of parental origin is also known to act at the level of single genes. In most experiments dealing with imprinting it is assumed that imprinting leads to functional inactivation of genes. Around 10% of the mouse genome is now known to be affected by parental imprinting in this sense. Genomic imprinting has recently assumed significance because of its occurrence in several human genetic disorders such as the juvenile forms of Huntington's disease, Prader-Willi and Angelman deletion syndromes and in Wilm's tumour, a childhood tumour of the kidney. In order to account for a number of experimental results, it has been postulated that there exist *imprintor* loci in addition to the imprinted loci. The first genetic evidence for the existence of an 'imprintor' gene has now been reported (Jiři Forejt and Soňa Gregorova, *Cell*, 1992, **70**, 443–450). The discovery of an imprintor locus is a significant step towards our understanding of the control