

CSIR NEWS

VOL 56 NO13 15 JULY 2006



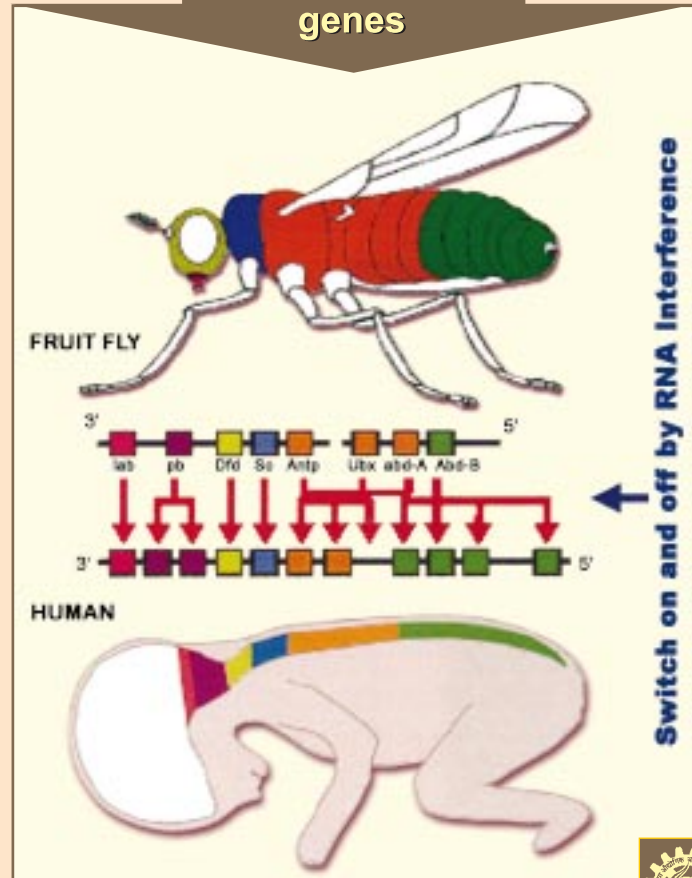
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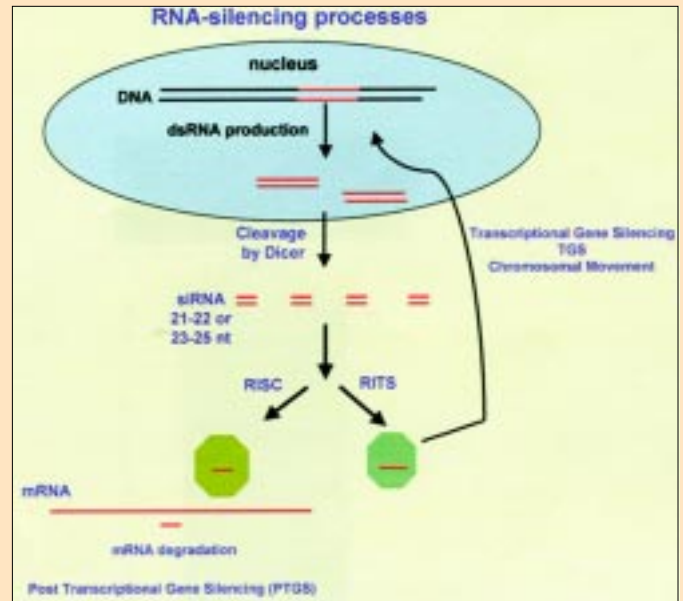
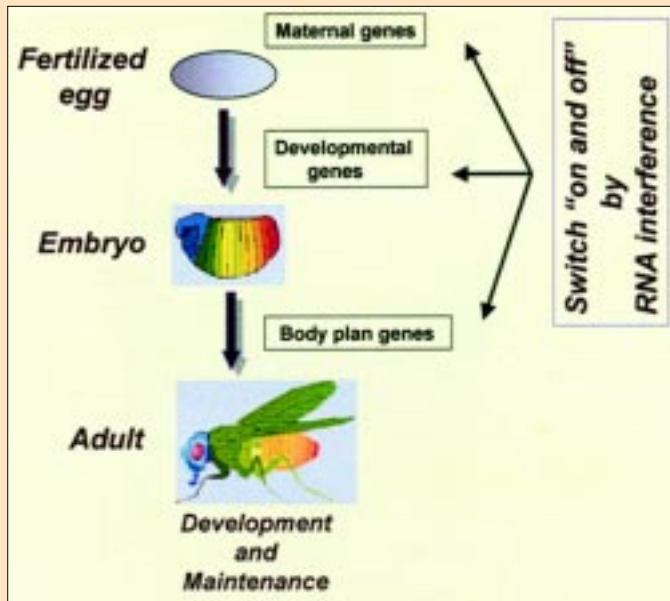
Step towards Understanding Human Development

ILL recently, it was known that proteins play an important role in the regulation and expression of genes at various stages of development. However, now it has been shown that there is another biological entity called RNAi, which is also responsible for the regulation of gene expressions during the development. It is now known that different genes need to be expressed at different stages of growth and maintenance of the animal; thus, specific genes need to be expressed at specific time point whenever required and is shut off when the job of the gene is done.

Recently Dr Utpal Bhadra at the Centre for Cellular and Molecular Biology (CCMB), Hyderabad, and Dr Manika Pal Bhadra at the Indian Institute of Chemical Technology (IICT), Hyderabad, and co-workers have further unraveled the mystery of complex processes in animal and human development using RNAi. In a research paper, which was recently published in a prestigious journal *Cell* by a team of CCMB scientists led by Utpal Bhadra and Manika Pal Bhadra from IICT have presented an intriguing, new and path-breaking example of how the RNAi machinery contributes to the nuclear organization with a consequence on gene expression.

Similarities of developmental genes





For their studies they used the genetically well-developed model organism, fruitfly for understanding the role of RNAi. They have further investigated that how different developmental genes are regulated through RNAi machinery in executing the specific body plan in a sequence-specific manner. Their findings, for the first time, suggested that the fascinating new mechanism of RNAi machinery not only influences the regulation of a specific gene but also helps in bringing the genes from different chromosomes together promoting higher-order nuclear organization which is essential for the development and maintenance of the organism.

The understanding of the mechanism of RNAi could be helpful in modern medicine by using the power of RNAi for destroying, for example, the machinery of infectious organisms, and as a powerful therapy against broad spectrum of complex and

contagious diseases. Developmental abnormalities are known to cause various birth defects in heart formation, few types of cancers such as brain tumours and fatal neuro-degenerative diseases. Understanding of the novel RNAi mechanism will also help to find ways and means to control the

developmental defects with greater success than before. Though it is a long way to go, taking into account the intricate role, which RNAi plays during the development of an organism, it may be possible to think of approaches, which could help in correcting the developmental defects at a very early stage



Dr Utpal Bhadra and Dr Manika Pal Bhadra, who carried out this research work

Facile Syntheses of a Class of Supramolecular Gelator Following a Combinatorial Library Approach – Dynamic Light Scattering and Small-Angle Neutron Scattering Studies

SUPRAMOLECULAR gelling agents are small organic molecules capable of hardening various organic (organogelators) and aqueous (hydrogelators) solvents. They are important to study because of their various potential applications in material science and bio-medical applications.

P. Dastidar, S. Okabe, K. Nakano, K. Lida, M. Miyata, N. Tohnai and M. Shibayama of the Central Salt and Marine Chemicals Research Institute (CSMCRI), Bhavnagar, have published an overview of the facile syntheses of a class of supramolecular gelator following a combinatorial library approach – dynamic light scattering and small-angle neutron scattering in *Chemistry of Materials*, 17 (2005) 741-748.

Synthesizing gelator molecule at will is a major challenge because the molecular level information of gelling agent's aggregate structure is not well understood. Following supramolecular synthon approach a combinatorial library of 60 organic

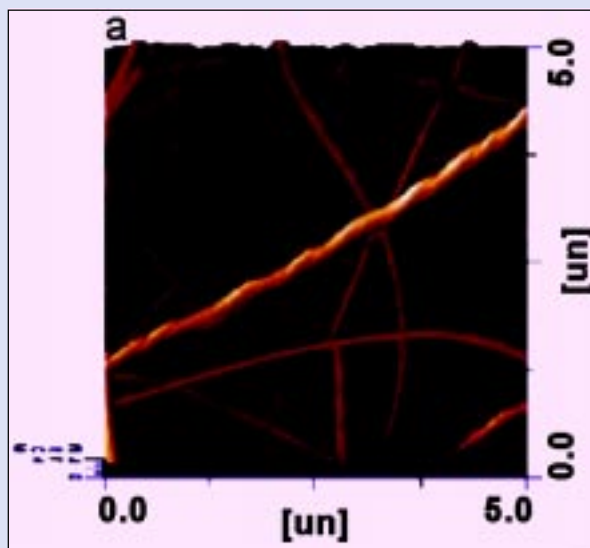


Fig: AFM micrograph displaying the helical morphology of the fibers of the gelator

salts by combining 5 bile acids and 12 secondary amines with various side arms have been prepared for potential supramolecular gelators. Scanning the library revealed that 16 salts are supramolecular gelators of which 6 are ambidextrous displaying the ability to gel organic as well as aqueous solvents. AFM micrographs of the one of the gelators revealed a novel helical morphology of the gel fibers (Fig.). Various stages of gel formation mechanism have been proved using dynamic light scattering (DLS) and small angle neutron scattering (SANS) studies.

International Patents granted to NEERI

AT the National Environmental Engineering Research Institute (NEERI), Nagpur, following two international patents have been granted during 2005-2006:

- US patent No. 6,929,810 — Preparation of oil compositions for portable liquid disinfection, Dr H.J.Purohit
- European Patent No. W.O.200/4087584 — System and method for the treatment of wastewater, Dr Rakesh Kumar, Scientist & Head, Mumbai Zonal Lab, Mumbai



Central Food Technological Research Institute, Mysore

R & D Highlights

ON the Research and Development front the Central Food Technological Research Institute (CFTRI), Mysore, has continued work on four groups under the Major Laboratory Projects spanning a wide-spectrum of areas in Food Science and Technology, initiated during 2003-04. The areas are, broadly, Value addition to agrimaterials; Health and foods, New and novel processes and Long term strategic research. In addition to these, the institute has contributed to multi-laboratory networked R&D programmes of CSIR, as part of 10th five year plan. The concern of the institute towards environment got recognized with the award of ISO 14001 certification for its environmental management system. This added a new feather in the institute's cap after ISO 9001:2000 and NABL accreditation.

Technology transfer & Consultancy provided

On the industrial scenario, CFTRI released fifty four processes to eighty six parties for commercial exploitation and forty six processes were demonstrated to sixty four parties. Also twenty-five new processes were made ready for commercial exploitation. The institute analysed a total of 1493 samples from industries and various organizations for physico-chemical attributes and nutritional quality. These samples included imported food articles and often involved special investigations.

Of the forty eight technical consultancy assignments taken up, twenty seven have been completed. Six industry sponsored research projects were completed out of the eighteen projects taken up. Of the total of ninety two grant-in-aid projects in the area of food science and technology operated during the year, fourteen were completed.

Technical counseling services against 1132 queries were rendered to entrepreneurs and government agencies. A total of 7012 technical enquiries were processed.

Patents filed

Fifty nine patents were filed in India and forty one patents abroad, including PCT countries. By reaching the 100 mark for the fourth consecutive year the institute has asserted its position as a leading innovator in Food Science and Technology R&D in the country and abroad.

Some of the major R & D activities are highlighted here:

Value addition to agri-materials

Processes for osmo-dried chunks of papaya and sapota have been developed. The product has a shelf life of six months at room temperature when packed in metallized polyester/poly films. Equilibrium relative humidity studies of osmo-dried amla have been completed. Packaging studies in accelerated conditions have been carried out. The processing conditions for amla pulp, amla juice and concentrate, amla beverages and dehydrated amla powder have

been optimized. Interactions of hydrocolloids such as, sodium alginate, guar gum, pectin, carragenan, agar and carboxymethyl cellulose, that can influence the gelling characteristics of mango and banana pulps have been studied. Processing conditions have been optimized for the preparation of litchi and passion fruit juice powders. Equilibrium Relative Humidity (ERH) studies for the juice powders indicated that these products being hygroscopic, require foil laminate packaging material.

Studies on influence of different post harvest treatments and modified atmosphere packaging (MAP) on the storage life and quality of fresh litchi (var. China) fruits under low temperature conditions were carried out. Studies were also carried out to standardize suitable CFB box for long distance domestic transportation and export trade. Immature dates have been processed into value added products such as date pulp, date beverage and date juice concentrate. Processing conditions for these products have been optimized. A process for the preparation of date syrup with a total soluble solids of 75°Brix, from mature, ripe dates have been developed. Tamarind paste, prepared with the pulp extracted in water, using salt and turmeric or salt alone, could be preserved well for six months. Tamarind powder was prepared by grinding raw, green, unripe tamarind pods with salt and turmeric, followed by drying in a

cabinet drier. Raw tamarind was made into a pickle (thokku) and chutney powder with spice powders.

The storage studies of dehydrated bamboo shoots were carried out by using two different packaging materials, namely Met.PET/PE and Polypropylene. The product was found to be acceptable upto six months of storage. Process conditions for bamboo shoot candy, in the form of cubes and rings were standardized. The products were found to be suitable for imparting flavours of ginger, cardamom and pineapple. Bamboo shoot chutney/spread was prepared using vinegar as preservative.

A process was developed for coating cereal flakes with chicken meat/powder to obtain chicken flakes. The effect of freezing and frozen storage on the quality of chicken cutlet was studied. The product was found to be in acceptable state upto four months of storage at -20°C . Proteases from tilapia (*Oreochromis spp.*) exhibited more activity in near neutral and acidic conditions. Acid ensiling could stabilize the waste against bacterial degradation but could not stabilize the proteases to the desired levels. Methods were developed for the separation of shell membrane from both wet and dry egg shells.

Food and health

The effect of various conventional cooking methods and also treating the dal with selected chemicals prior to cooking were examined for reduction in the neuro-toxin of the Khesari dal. It was found that detoxification greatly

reduces the levels of toxicant in the Khesari dal ($> 80\%$) resulting in significant attenuation of oxidative stress in both hepatic/neural tissue and in lower degree of acetyl cholinesterase (AchE) inhibition by detoxified Khesari dal. Two products namely, papads and snacks were prepared from moth bean. A process for the preparation of ready-to-eat sweet and savory snacks from maize grits was standardized. Parboiling the millet grains improved the yield of the coarse fraction and imparted a very dark colour to the semolina. Some of the functional properties of finger millet malt based health food (beverage) developed were determined. With a slight modification in its composition, the product would become satisfactorily dispensable in tea/coffee vending machines.

The formulations and process parameters for preparation of nutraceutically enriched tamarind candy were standardized. Dietary fiber was incorporated in to chicki by replacing peanut, the major ingredient with wheat bran. Replacing peanuts with bran as well as walnut at optimum level resulted in products rich in fiber as well as PUFA, rendering the chicki a better health snack. A process for the preparation of dry beverage mix based on cashew apple juice that can be reconstituted to obtain either a still or a carbonated beverage was also developed. Flavour profiling of different varieties of cashew apple fruits was also done. Studies were carried out to understand the effect of processing parameters such as soaking of beans, solid content of milk, thermal treatment of milk,

method of copulation, coagulation time and molding on the texture and quality of tofu. Candy and dry beverage mix were developed from cashew apple and its juice, respectively. Coconut sap was clarified, filtered and evaporated to obtain a syrup of honey-like consistency.

Both low molecular weight chitosan and chito-oligosaccharides have shown excellent antimicrobial activity against several food borne pathogens. They show lytic rather than static effect on them. SEM studies have indicated that their bactericidal activity is due to induction of spore formation followed by permeabilization of the bacterial cell wall, which is further confirmed by the analyses of specific marker proteins/fatty acids in the cell free supernatants. Purification and partial characterization of xylanase and acetic acid esterase from ragi malt have been achieved. Purified xylanase is found to be monomeric with a M_w of 20 kDa as determined by SDS-PAGE. EDTA and mercuric chloride are found to inhibit the xylanase activity, whereas divalent cations such as calcium, magnesium, nickel, increase its activity. Gibberellic acid treatment has been found to increase the activity. The influence of food acidulants - citric acid, tamarind, amchur and kokum by including them at levels that reduced the pH by one unit, on the in vitro bioavailability of zinc from cereals and pulses have been examined.

Effect of α -terpinene from cumin on aggregation of human platelets was examined. The release



of MDA and serotonin was affected by α -terpinene. α -pinene, another active component of cumin also inhibited ADP, epinephrine and collagen-induced platelet aggregation. A significant reduction in the concentrations of curcumin, capsaicin and piperine as a result of heat processing of parent spices as in domestic cooking was evidenced. The water extractables from hexane, ethyl acetate, acetone and methanol extracts of the barks of *G. cowa* showed that the IC_{50} (in mg) of antiplatelet aggregation activity is in the order hexane (0.43) > acetone (0.72) > methanol (0.92) > ethylacetate (1.6). Hexane and chloroform extracts of *G. xanthochymus* exhibited antibacterial activity against *B. cereus*, *S. aureus*, *Y. enterocolitica*, *L. monocytogenes* and *E. coli*. Bioactive compounds isolated from pomegranate waste and mango ginger were characterized through spectroscopic studies.

Formulations and process parameters for preparation of fiber enriched chutney powder, chutney spread, wadian and papad were standardized. Water soluble arabinoxylans were isolated from native and malted rice and ragi. It was observed that during frying, blended oils produced lesser amount of thermally degraded products. The tree borne oilseeds such as *Jatropha*, *Karanja* and *Simarouba* were analyzed for their major constituents. The oils were found to be high in fat content as against the high content of protein in kernel fractions.

Effect of addition of fenugreek seed powder, curcuminoids and

ground flaxseeds on rheological characteristics of dough and quality characteristics of parotta, chapati, bread, cakes and cookies were studied. Substitution of different levels of fenugreek on the quality of bread showed a decrease in loaf volume as well as the overall quality score. Parotta with appealing yellow colour could be produced by adding either pure curcuminoids or commercial curcumin powder. Raw wheat germ was used in the preparation of chapati. Chapatis became delicate and less pliable with the addition of increased levels of whey powder. The potential of apple pomace to impart a pleasant fruity aroma apart from enhancing fiber content was exploited in a formulation for cake. Studies were undertaken to arrive at suitable cost-effective packages for traditional sweets such as Karigadabu and Holige in addition to bakery products such as coconut cookie, biscuits and rusk, to enhance their shelf life. The nutritional quality of sesame meal was improved through experimental studies to reduce the antinutritional constituents in sesame seed. Conditions to obtain protein rich edible flour from soy with different nitrogen suitability indices were optimized.

The major amylase from jowar, a 47 kDa α -amylase, was purified to homogeneity from germinated jowar and characterised. Weaning food formulations were prepared using cereals, pulses, oilseeds, protein concentrates and milk proteins. The formulation provides 360-370 Kcal energy and 22% protein with improved digestibility.

Two novel pigments, partially

saturated canthaxanthin and astaxanthin from *Aspergillus carbonarius* were identified and characterized by optical spectrometry, mass spectrometry and NMR spectroscopy. *Mucor rouxii* and *Mortierella alpina* (oleaginous fungi) were selected for lipid and PUFA production. The cultivation medium was standardized for maximum biomass production. Lactic acid bacteria, from different food products were isolated, screened and characterized. These were studied for probiotic properties of the organisms. The culture was incorporated into curd for biocurd formation and shelf-life of the curd was studied. Eugenol, curcumin and quercetin exhibited relatively higher inhibitory effect against activity of 5-lipoxygenase from human polymorphonuclear leucocytes (PMNL) cells compared to capsaicin and piperine. Feeding of quercetin and curcumin appeared to provide better amelioration of the glomerular filtration rate relative to starch feeding. Significant amelioration in albumin excretion during diabetes was observed by feeding dietary antioxidants-quercetin and curcumin at low levels.

Attempts were made to convert ferulic acid into vanillic acid by *A. niger*, CFR 1105 using wheat bran and the supernatant of autoclaved wheat bran as substrates. Dietary compounds were screened for potential antimetastatic activity based on the galectin-mediated agglutination assay with normal red blood cells. It was found that a pectic polysaccharide isolated from

swallow root (*D. hamiltonii*) exhibits better potency in inhibiting the agglutination. Immuno-histological studies indicated the expression of galectin only in malignant tissues and not in benign ones. *P. sowa* and *S. oleracea* were found to be rich sources of b-carotene for health benefits.

Studies were conducted to measure the basal angiotensin converting enzyme (ACE) activity in rat tissues. ACE activity was found to vary in different rat tissues as well as among different age groups of rats. The chymotrypsin digested fractions of sorghum storage protein, a-kafirin, was found to possess strong ACE inhibitory activity. Extracts of *Porphyra* and *Enteromorpha* exhibited antioxidant activities in in vitro models. Incorporation at low levels of euclidean and enteromorpha was found to improve bread and chapatti making qualities of the dough. Analysis of 23 species of mushroom samples, received from all over the country for minerals, contained Ca, K, P and Fe in significant quantities. Fabrication of 'Rural dryer' for mushrooms drying was in progress.

ISP Medium I was chosen to be the basal medium to start the experiments to optimise carbon, inorganic nitrogen and organic nitrogen sources for production of streptolipin, a lipase inhibitor. Glucose and yeast extract were found to be the best carbon and nitrogen source, respectively, for highest streptolipin production at shake flask level. Corncobs, a rich source of xylose was converted to xylitol by using yeast, *Pichia farinosa*. The conditions for

optimization of acid hydrolysis for both corncobs and bagasse were standardized. Production of xylitol from corncobs carried out in a 25 L fermentor resulted in a maximum yield of 0.46 g/g of xylose. The culture, harvested by centrifugation, was subjected to micro filtration to remove the cells present. IR treatment was found to arrest the free fatty acid development as well as lipase activity in brown/under milled rice. Cooking quality of the rice did not change much after IR treatment compared to raw rice. Industrial trials were carried out for production of shelf stable brown/under-milled rice, employing hydrothermal treatment followed by drying in shade. Milling trials were carried out in laboratory as well as commercial rice mills.

New and novel processes

Herbal materials that exhibited the potential to inhibit feeding in filarial mosquito (*Culex quinquefasciatus*) by over 90% and that of dengue fever mosquito (*A. aegypti*) by about 50%, when burnt in mosquito coils, have been identified. The inhibitory effect is not found to be sufficient enough to deliver desirable results in respect of *A. aegypti*. The aqueous and methanolic extracts of *D. hamiltonii* showed antioxidant activity. Several bioactive molecules have been isolated from both aqueous and methanolic extracts of herbs. One of the molecules has exhibited cytoprotective action in isolated hepatocytes indicating its hepatoprotective potential. Thermally treated tapioca starch, when added upto 1% level, significantly improved the texture

and mouthfeel of blackgram vada. Enzymatically modified rice starch was found to lower the fat content of samosa to a large extent, without affecting its sensory quality.

A standardized experimental procedure was developed for the measurement of texture or crispness of boondi. Both the forming and the frying units of vada fryer were integrated. A few trials were conducted on forming and frying operations with automatic controls. Attempts were also made to integrate a temperature based ON-OFF control system to electric rice cooker. A home scale sterilizer that can be operated in both manual as well as automatic mode was designed. Special racking system was designed to suit the geometry of the pouches for predictable heat transfer. A sugarcane deskinning machine was developed. Its performance was evaluated with canes of different sizes. A spouted bed roaster for food grains/coffee beans was designed, and is under fabrication. A hot air roasting machine based on LPG was designed and fabricated. Dry run of the machine was carried out. The effects of irradiation on turmeric, potatoes, carrots, gum dispersion, food items, dough, enzymes and meat were studied. Chilli, an important source of carotenoids, was harnessed to produce a pungency free water-soluble orange red colorant.

A water-soluble formulation with increased protection against fading in UV light was developed for both chilli and turmeric colorants. Simple processes were developed for the synthesis of tetrahydro



curcumin and methyl ethers of curcuminoids. A process involving the selective reduction of olefinic double bonds was developed. An enzyme-assisted method was developed to make coffee conserves with higher content of constituents responsible for the antioxidant activity. An improved method for the production of nutraceutical rich green tea was developed. A bacterial strain and an enzyme responsible for caffeine degradation were identified. Potent fungal strains capable of biotransforming caffeine to theophylline and other methyl xanthines were isolated. Various solvent systems were screened and an antioxidant-rich coffee conserve was obtained in yields of 15-25%. The chlorogenic acid content in the conserve varied from 6-8%. Water conserve from dark roasted coffee was found to inhibit the growth of *Mimosa pudica* L. seeds significantly. The ratio of high molecular weight proteins to low molecular weight proteins was found to have a good correlation with chapati quality. A two stage process for the production of fructo-oligosaccharides (FOS) was optimized using response surface methodology.

An indigenous ELISA technique to detect *S. oryzae* - a stored grain pest - was developed from rabbit antibodies. Process parameters were standardized for different formulations of yoghurt, replacing dairy milk with soya milk at different levels. The colour of the product appeared to vary with the level of replacement with soya milk. A digital image processing (DIP) method was developed for analyzing the carotenoid content in *Haematococcus pluvialis*. A simple

autotrophic culture medium was developed for the cultivation of *Dunaliella salina*. The influence of light quality and intensity, pH, and salt concentration on the culture growth was studied to arrive at optimal conditions for the maximum growth of *Dunaliella*. Downstream processing of carotenoids from *Dunaliella* was initiated.

Rodent models were used for in vivo studies on the antioxidant and hepatoprotective activity. Primers were designed for cloning of capsaicin synthase based on the N terminal amino acid sequence of the purified protein. Western blot analysis for capsaicin synthase was standardized. Efficient regeneration protocols for *C. annum* and *C. frutescens* were standardized. A protocol was developed for the transformation of *Coffea canephora* using both *Agrobacterium rhizogenes* and *A. tumefaciens*. A protocol for direct organogenesis in *Bixa orellana* was developed using thidiazuron (TDZ) in combination with coconut water. A suitable and exclusive procedure for the estimation of 2-hydroxy-4-methoxybenzaldehyde from the roots of *D. hamiltonii* and *H. indicus*, using GC and HPLC, was developed. Stabilization studies using encapsulation technique on the volatiles were completed. Flavour concentration for sherbet preparation using the roots of *D. hamiltonii* and *H. indicus* has also been optimized.

Coffee bean flakes were prepared using various types of green coffee beans such as Arabica parchment, Arabica cherry, Arabica bits, Robusta cherry, Robusta blacks, bits and browns. Coffee

conserves were prepared using various solvents and solvent mixtures. A novel mouth freshener was prepared using various types of coffee flakes.

Experiments were carried out to construct recombinant strains that can produce polyhydroxyalkanoate (PHA) copolymers of acceptable characteristics. Traditional food products, thermally processed in retort pouches, were subjected to storage and sensory studies. The vegetarian products were found to have an acceptable shelf life of nine months against six month of chicken curry. The protocol of an integrated process for separation of C-phycocyanin from a homogenate of *Spirulina platensis*, consisting of three stages of extraction for achieving solid removal, purification, concentration and separation of C-phycocyanin from the phase components, has been developed.

Micropropagation method for mass multiplication of *Stevia rebaudiana* was standardized by using different auxins, cytokinins and gibberellins along with growth promoting agents such as silver nitrate, triacontanol and activated charcoal. The media composition for both multiple shoot formation and in vitro rooting were standardized. Pure stevioside was obtained by extraction followed by crystallization. Presumptive isolates of *Listeria* were characterized based on morphological and biochemical tests including that of phospholipase and CAMP test. Sixty three isolates were identified as *Listeria* spp. The majority of the isolates of *Listeria* were identified to be *Listeria grayi*.

The prevalence of *Yersinia* spp. was also assessed in milk, cereals, vegetable and meat based samples. The presumptive isolates of *Yersinia* spp. were also characterized based on morphological and biochemical tests. Polymerase chain reaction (PCR) and multiplex PCR were standardized for the detection of Ochratoxigenic aspergilli. Studies on the antibacterial activity of sclerotinin by agar well diffusion method on both gram +ve and gram -ve bacteria have revealed antibacterial action against *Bacillus* spp. PCR based method for the detection of GM in processed foods has been studied. Validation studies have been carried out with DNA and primers for GM-soya and Bt-cotton.

The institute also undertook a few programmes that would be beneficial to the rural and semi-urban entrepreneurs towards self or group employment through food processing. The programmes included demonstration-cum training in the preparation of sugar or jaggery based traditional sweets-chikki and gajak, spice powders and curry powders with good manufacturing practices, popularisation of bakery products, training of women entrepreneurs for the establishment of rural bakeries, improvements to mini dal mill to suit rural areas, nutritive bakery products through biotechnological approaches, apart from a specially designed short term course for rural entrepreneurs.

Human Resource Development

In the area of human resource development, Masters' degree in Food Technology was awarded to

twenty students including three students from abroad completed their certificate course in Milling Technology. The institute conducted forty two short-term courses benefiting 530 personnel from industry. One hundred and seventy eight students from professional colleges carried out project work in partial fulfillment of their degrees. Ten students were awarded Ph. D. degree by various universities, while twelve persons have submitted their doctoral theses. The scientists of the institute also participated as faculty in various post-graduate programmes conducted by University of Mysore.

Publications

The institute published 130 research papers and 29 reviews apart from 13 papers that appeared in various proceedings. A total of 177 papers were presented by 203 S&T staff in 29 National conferences and 15 papers were presented by 19 scientists in 12 International conferences.

Honours and Awards

Three of the institute scientists received national recognition. Dr G.A. Ravishankar was conferred with Prof. V. Subramanyan Industrial Achievement Award, while Dr N.K. Rastogi received Laljee Godhoo Smarak Nidhi award and Shri A.S. Chauhan bagged Young Scientist Award for their contributions to the area of food science and technology. Topping them all was the decoration of 'Padma Shri' to Dr V. Prakash by Hon'ble President of India in a ceremony held in Rashtrapati Bhavan.

Patents filed by IIP in Foreign Countries

THE following patents have been filed in the recent past, by Indian Institute of Petroleum (IIP), Dehra Dun, in the foreign countries:

- A process for the preparation of vanadyl pyrophosphate catalysts with improved structural characteristics for the selective oxidation of butane to maleic anhydride, A. Datta, S. Dasgupta, M. Agarwal. Europe 037000205, dated 23.06.2005; Australia 2003200849, dated 27.06.2005; Norway 20053128, dated 27.06.2005; Japan 2004-564355, dated 01.07.2005; S. Korea 2005-7012522, dated 01.07.2005; China (awaited), dated 04.07.2005.
- A process for the production of high-octane gasoline from straight-run light naphtha on Pt containing HZSM-5 molecular sieve catalyst, P. Vijayanand, S. M. Dhir, Lalji Dixit, S. Chopra. Japan 2004-563398, dated 24.06.2005; Europe 02781717.0, dated 27.06.2005; UAE 353/2005, dated 27.06.2005.
- An improved process for the extraction of aromatics from petroleum streams by NMP using re-extraction route for hydrocarbon recovery from exhaust phase, M. K. Khanna, S. M. Nanoti, Guru Prasad, B. R. Nautiyal, M. O. Garg, Alok Saxena, Pradeep Kumar. Japan 2004-556579, dated 24.06.2005; UAE 352/2005, dated 27.06.2005; Europe 02781720.4, dated 27.06.2005.



Dr R.A. Mashelkar inaugurates R&D Facilities at RRL, Bhopal

PADMABHUSHAN, Dr R. A. Mashelkar, FRS, Director General, Council of Scientific and Industrial Research and Secretary, DSIR, inaugurated Technology Enabling Centre, Computer Simulation and Design Centre, Microfluidics and MEMS Center and Computational Fluid Dynamics Center at the Regional Research Laboratory (RRL), Bhopal.

During his visit to the laboratory, Dr Mashelkar also witnessed the progress made under various R&D activities of the laboratory in the areas of Wood Substitute, Building Materials, Sisal Composites, Materials from Industrial Wastes, Automobile Sector, Modeling and Design, Cellular Materials, Light Materials, Tribo Materials, Environmental Modeling, CFD Application in Minerals Processing and Minerals Processing Design. He underlined the need to innovate cost effective new materials from natural resources. He appreciated the work done by the laboratory in the areas of Natural Fibre Composites, AI Foam, and Microfluidics and MEMS.

The Technology Enabling Centre is established at the laboratory to train the entrepreneurs, commercialize the technologies and design and development of machineries relating to the technology for making



Dr R. A. Mashelkar, Director General, CSIR, inaugurates Technology Enabling Centre for natural fibre resources composites. Seen on his left is Dr N. Ramakrishnan, Director, RRL, Bhopal

composites using industrial wastes, natural fibre and polymer. Dr Mashelkar highlighted the centre in his address as the representation of an ambition to look at the natural wealth of the country and addition of value to it. The main functions of the Microfluidics and MEMS Centre of the laboratory are to develop and characterize the Micro Total Analytical System (μ -TAS) and their application for single molecule analysis and to develop miniaturized fuel cells for micro power generation. Dr Mashelkar underlined the MEMS Centre as the technologies of the tomorrow. The Computational Fluid Dynamics Centre will work for Simulation, Design and Development of

different mineral processing unit operations, Simulation and design of environmental control technologies and water resource modeling. The CFD application also includes consequence modeling of flammable material explosion and blast hazard analysis by applying PHST software.

The Computer Simulation and Design Center is working for Simulation of film growth, Finite element simulation of tube extrusion and die design. Analysis of spring-back in sheet metal bending, Effect of friction in hot die forging, FEM characterization of Ductile Fracture, Casting simulation of porthole die extrusion, Application of Artificial Neural Network in Structural Shape Optimization and

Simulation of nozzle pull out.

While addressing the staff of RRL, Bhopal, Dr Mashelkar highlighted the progress made by the laboratory. He said that the lab has a happy smell in terms of attitude, passion and commitment. The physical income of the laboratory has gone up by three but the psychic income has gone up many-folds through the commitment and satisfaction for the work being done here by the scientists, he said. Highlighting the progress graph of CSIR during 1995-2005 he said that he was dangerously optimistic about the future of the country and it was not a hype, it is real hope. The issue is not about having resources, the issue is about having ideas, he said.

Dr N. Ramakrishnan, Director, RRL, presented a report on the activities of the laboratory on the occasion.

International Conference on Innovation and Technology Management (ICITM 2006)

THE Central Glass and Ceramic Research Institute (CGCRI), Kolkata, organized an International Conference on Innovation and Technology Management (ICITM 2006) in recent past. The conference was jointly organized by CGCRI and Indian Association for Productivity, Quality and Reliability (IAPQR), Kolkata. The conference provided a forum for focused discussion on innovation and technology management, which have become buzzwords of science and technology all over the world.

Dr Subir Bhattacharyya, former Managing Director, Durgapur Steel Plant, inaugurated the conference. Prof. J. K. Ghosh, former Director, Indian Statistical Institute (ISI), was the Guest of Honour during the inaugural session. Dr H. S. Maiti, Director, CGCRI and Chairman, Organizing Committee, delivered the welcome address. Dr Maiti said that wisdom acquired through ages had brought us to the realization that invention in isolation, within the closed boundaries of an entity such as a laboratory, institute, or the country, could lead us nowhere. So, coping competition with collaboration, facing challenges with cooperation, tackling complexities with networking would be the guiding philosophy of the world economy of tomorrow. It is not technology and innovation per se which give a nation an economic advantage; rather it is the efficient and professional management which acts as the real booster, he added. Prof S. P. Mukherjee, President, IAPQR and Co-Chairman, Organizing Committee, said that innovation was not primarily invention. It is the small incremental innovations which lead to big

invention. He cleared the misnomers that we encounter in matters related to creativity and lateral thinking. Prof. J. K. Ghosh stressed on laying freedom of thought as means of instilling creativity in children and reminded that supportive environment was essential for good education and innovative thinking. He told that the education system in the western countries had considerably gained from the supportive environment that their societies provided.

Dr Subir Bhattacharyya, narrated his experience of innovation with special reference to the steel industry in the country. On this occasion a book entitled Creative Management authored by Prof. H.S. Ray, Convenor of the ICITM 2006 programme, was released by the Chief Guest. Prof Ray, former Director, Regional Research Laboratory, Bhubaneswar and presently an Emeritus Scientist at CGCRI, (under AICTE scheme) proposed the vote of thanks.

The proceedings were divided into three plenary and ten technical sessions, the latter being conducted in parallel mode. More than sixty papers were presented during these sessions which dwelt upon diverse facets of Innovation and Knowledge Management, Societal Applications, IPR and Related Issues, Technology Management and Innovative R&D.

The plenary speakers were Dr Amit Chatterjee, Adviser to MD, Tata Steel, Jamshedpur; Dr S.C. Purohit, Director, C-DAC, Pune; Shri Sanjiv Kerkar, Sr. GM, ICICI Bank, Mumbai; Dr A. Rastogi, MD, Quest Techno Consultants, New Delhi; Dr H. S. Maiti, Director, CGCRI; Prof. S.C.Roy, Bose Institute, Kolkata and Dr R. R. Hirwani, Head,



URDIP, Pune; and Mr Peter S. Murphy, Executive Director, Power Plus Fuel Technologies Limited, UK.

About 100 delegates from renowned academic institutions, industry and research laboratories in the country participated in the conference. A couple of corporate executives from the Power Plus Technologies, United Kingdom, fulfilled the international mark of the conference. The conference received financial assistance from the Department of Science and Technology (DST), New Delhi; CSIR, New Delhi; Ministry of Information Technology, New Delhi; Board of Research in Nuclear Sciences (BRNS), Mumbai; ICIL, Kolkata; Tyco India Limited, Kolkata; ICICI Bank, Mumbai; Kitchen Appliances, Kolkata; UCO Bank; Institute for Inspiration and Self Development, Kolkata; CMERI, Durgapur and CGCRI, Kolkata.

The three-day conference was successfully concluded with notes by Dr Amit Chatterjee, Adviser to MD, Tata Steel who chaired the concluding session to sum up his impressions on the programme. Dr Chatterjee appreciated India's innovative capacity and as matter of evidence cited instance of a R&D unit in Bangalore set up by the General Electric, USA where cutting edge research funded by the company is being successfully undertaken by indigenous talents trained in Indian environment. He added that given the proper will, such small pockets could also extend to other parts of the country. His highly informative plenary talk and thought provoking concluding remarks left indelible impression on the audience. His presence and moral support along with those of others contributed significantly to the success of the programme.

International Workshop on R&D Frontiers in Water and Wastewater Management

THE National Environmental Engineering Research Institute (NEERI), Nagpur, organized Water 2006-NEERI, an International Workshop on R&D frontiers in Water and Wastewater Management in the recent past. In the inaugural function Dr S. N. Pathan, Vice-Chancellor, RSTM, Nagpur University, presided as the Chief Guest. Shri S. L. Goklaney, Managing Director, Eureka Forbes Ltd, Mumbai, was the Chair Person on this occasion.

While speaking at the inaugural function, Dr Pathan remarked that providing clean and safe water to every home at affordable cost still remains a challenge for the scientific community. Institutes like the NEERI should develop cost effective technologies for water purification, he urged. Dr Pathan

said that pollutants like arsenic, iron and fluoride severely affect the drinking water quality in cities as well as in rural areas. The overall drinking water scenario in the country continues to be grim, as over 3000 children die every year due to water-borne diseases, he alarmed. Appreciating the role of NEERI in projects like the Rajiv Gandhi Drinking Water Mission and development of other water related technologies, Dr Pathan said in the present century water will play the same role in world that oil played in the 20th century. Dr Pathan also released the workshop souvenir during the function.

Delivering the presidential address on this occasion, Shri S. L. Goklaney said that his company (Eureka Forbes Ltd) would play a pivotal role in making the 'India Water Mission 2025' a reality. Listing the various



Dr S. N. Pathan, Shri S. L. Goklaney and Dr Sukumar Devotta at the Exhibition held during the Workshop

achievements of the company in past twenty years, he said that over 3 million people across the country now have access to safe drinking water through major 5 technologies and 20 products developed by Eureka Forbes Ltd.

In his welcome address, Dr Sukumar Devotta, Director, NEERI, said that industrialization and increased population have made 'water management' a challenge for the country. Based on the projections made by various experts, he alarmed that in future India may become the water starved country. Dr Devotta appraised the audience about various water purification technologies developed by NEERI like rapid detection kits, de-arsenification and de-fluoridation technologies and informed that NEERI is working on areas like membrane bioreactors, risk based and futuristic water standard and water augmentation.

Earlier, Dr Tapas Nandy, Scientist & Head, Wastewater Technology Division, NEERI, introduced the dignitaries. The inspiring messages from the Hon'ble

President of India, Dr A. P. J. Abdul Kalam, the Hon'ble Union Home Minister Shri Shivraj Patil and the Director-General of Council of Scientific and Industrial Research Dr R. A. Mashelkar were also read out. In the end, Dr M. V. Nanoti, Scientist & Head, Geo-Environmental Management Division, proposed the vote of thanks.

During the two-days International Workshop, national and international scientists and professors delivered various lectures in the respective technical sessions, namely, water resources, water quality management, future perspectives technology frontiers, wastewater management, industrial waste minimization and resource recovery and business opportunities and future perspective technology frontiers. Among those, the prominent speakers were Dr C. D. Thatte, Ex-Secretary General, ICID and Secretary to GOI, Pune; Dr P. R. Reddy, Emeritus Scientist, NGRI, Hyderabad; Dr M. Gopala-krishnan, Secretary General, ICID, New Delhi; Dr Samuel Godfrey,

Professional Officer (India), WHO; Dr R.R.Hirwani Scientist and Head, URDIP, Pune; Shri Deepak Kantawala, Consulting Engineer, Mumbai; Dr K. S. M. Rao, Scientist, Ranky Enviro Engineering Ltd, Hyderabad; Shri L. H. Sharma, Vice-President, Jain Irrigation Systems Ltd, Jalgaon; Dr Samiran Mahapatra, Scientist, HLL, Bangalore; Dr V. A.Mhaisalkar, Professor, VNIT, Nagpur and Dr D.K.Jain, Sr. Vice-President, Kanoria Chemicals and Industries Ltd, New Delhi.

A stage presentation was made by the school children from Mandu and Ganganagar Ashram (residential) Schools of Dhar district, Madhya Pradesh on UNICEF assisted project. The children highlighted the benefits of dilution of fluoridated groundwater with harvested rainwater to meet drinking/cooking water demand of their schools. The children explained the use and monitoring of Water Safety Plan by the school's Water Safety Club. About 80 posters related to the themes were also presented during the workshop. In the plenary session, R & D frontier issues pertaining to water and wastewater, which emerged during the workshop, were summarized. During the workshop, an exhibition of books/equipments/materials was organized by NEERI for different entrepreneurs show-casing their products and achievements in the area of water and wastewater management. This exhibition was largely visited by delegates, scientists and also students and teachers from local schools/colleges.



Shri Deepak Kantawala, Consulting Engineer, Mumbai (in middle) at the poster session along with Prof. V. A. Mhaisalkar, VNIT, Nagpur (left) and Dr. R. R. Hirwani, Scientist & Head, URDIP, Pune (right)

Project Officer, UNICEF; Dr Abhay Kumar, G M, Eureka Forbes Ltd; Prof. S. K. Gupta, IIT, Mumbai; Prof. S. W i d a n a - p a t h i r a n a , University of K e l a n i y a , Colombo; Shri Ajay Popat, CEO, Ion Exchange Waterleau Ltd; Dr A. K. S e n g u p t a ,



A Training Workshop on Need for Innovative Teaching in Science

THE Industrial Toxicology Research Centre (ITRC), Lucknow, organized a training workshop for middle and senior schoolteachers, under the programme 'Faculty Training and Motivation and Adoption of Schools and Colleges' funded by Human Resource Development Group of CSIR. This three days' course was scheduled for science teachers (chemistry, biology, environmental science, physics and mathematics) and was designed to emphasize the need for innovative methods of teaching that would enable them to motivate students and develop their interest in science. The intention has been that the course will result in teachers who are better informed about the new and emerging areas in science. A total of 28 teachers from 13 schools and colleges took



Seen on dais during the Training Workshop are: Dr P. K. Seth, CEO, Biotechnology Park, Lucknow & former Director ITRC (*centre*) with coordinators of the workshop Dr Poonam Kakkar (*on his right*) and Dr Farhat N. Jaffery (*on his left*)

part in training. Dr Farhat N. Jaffery and Dr Poonam Kakkar, Scientists, ITRC, coordinated the programme.

Dr P. K. Seth, CEO, Biotechnology Park, Lucknow and former Director of ITRC, delivered



Participants visiting laboratories at ITRC



the Keynote address. He highlighted the importance of introducing biotechnology in the curriculum of schools. There was a vast scope for the future entrepreneurs with increasing globalization, he informed.

The workshop covered a wide range of topics - biotechnology, innovative methods of teaching science, good laboratory practices, total quality management, grooming of students to select the right and successful careers. The faculty included renowned scientists, Dr Nitya Anand, former Director, CDRI and Prof. Bhumitra Dev, former Vice Chancellor, Gorakhpur and Bareilly Universities, besides senior scientists from ITRC. They emphasized on innovative methods of teaching science and its application in daily life and also the value of science teaching in building students' careers. It was explained how a scientific approach and temperament is important in developing creativity, interest and enthusiasm among students.

Importance of teaching intellectual property issues at school level; food safety— particularly the adulteration and contamination of popularly sold eatables were some other topics covered which were much appreciated by the participating teachers. Along with lectures, online science quiz, and tours of research labs were also organized. Ample time was allotted for interaction and discussion. The

programme also included experimental techniques and methods for applying strategies in the classroom.

The participants visited several laboratories of the institute: Analytical, Food Toxicology and Developmental Toxicology labs etc. Here, the participants were shown various instruments, their functioning and certain indigenous methodologies were also displayed. Scientists imparted demonstrations and briefed the participants about the need for development and adoption of cost-effective and rapid methods of testing.

Later, teachers interacted with each other to create lessons from everyday objects. In this way, their contribution in implementing new ideas and methods in the teaching of science in their schools was judged. After two days of intensive deliberations, a panel discussion was held to sort out the problems faced by teachers in conveying the practical application of theoretical lessons and ways of improving it. The programme was evaluated through post-workshop questionnaires. These indicated a high degree of teacher satisfaction with the quality of the training, the use of hands-on learning, and the applicability of the material to their own classes.

At the valedictory function, the teachers received certificates of participation from Dr Ashwani Kumar, Deputy Director, ITRC.

IICT bags Best Project Award for the year 2005-06

THE Indian Institute of Chemical Technology (IICT), Hyderabad, had undertaken a project entitled 'Control of Malaria Through Integrated Information Technology Tools in Arunachal Pradesh' in the year 2004 sponsored by Department of Science and Technology, Government of India. Hon'ble Minister Shri C. C. Singhpo awarded the best project award for the year 2005-06 to Dr J. S. Yadav, Director, IICT, and Dr U. S. N. Murty, Project leader, IICT, on behalf of Government of Arunachal Pradesh. The award comprises of a memento and a citation.

The main objective of the project is to exploit the built-in facilities of information technology for control of malaria in Arunachal Pradesh. The work was initiated jointly with Directorate of Medical Health, Government of Arunachal Pradesh. Dr U. S. N. Murty, Project Leader and his team mainly focused on the development of a database which consists of socio-economic details, epidemiological details, entomological details, mosquito dissection details and meteorological details. This software helps in building correlation between various parameters responsible for promoting this disease. The reports were web enabled and can be accessed using a network, so that timely action can be taken at an



Dr U.S.N. Murty Project Leader, Biology Division, IICT and Shri Rakesh Sharma, COA, IICT, receiving the award of excellence from the Hon'ble Minister for Health & Family Welfare Shri C.C. Singhpo, Government of Arunachal Pradesh

appropriate endemic zone. This facility will help about 75 primary health care centers in twelve districts of the state.

A two-day training programme was also organized by Dr U. S. N. Murty, Head, Biology Division, IICT, at Administrative Training Institute (ATI), Naharlagun, Arunachal Pradesh recently. The programme was inaugurated by Shri C. C. Singhpo, Honorable Minister for Health and Family welfare, Government of AP. Hon'ble Minister Shri C. C. Singhpo expressed that the software will be very much useful in tackling the malaria menace in the state. Shri Rakesh Sharma, Sr. COA, IICT, handed over the software to Hon'ble Minister on behalf of Director, IICT. The Director Health services Dr G. Yomcha; Joint Director, National Vector Borne Diseases, Dr P. P. Chaliha; State epidemiologist, Dr L. Jampa; were present in the programme. About twenty participants comprising Dist. Medical officers, Dist. Malaria officers, Non-Government organizations, Sr. Medical officers and Medical officer from Indo-Tibet border police (ITBP) participated in the training programme.

International Symposium on Frontiers in Nanoscale Science, Technology and Education

THE National Physical Laboratory (NPL) New Delhi, is organizing International Symposium on Frontiers in Nanoscale Science, Technology and Education during 16-19 August 2006 at Cochin.

The international symposium will feature thematically arranged invited and contributed papers (poster sessions). The topics will be organized along application-oriented themes that deal with specific areas of technology such as nanoelectronics, nano-biotechnology, chemical and biological sensors, nano-energetics, and other technology enablers and platforms such as instrument development, materials synthesis and processing and development of modeling as a predictive tool. The symposium will include discussions on an array of educational experiences and opportunities designed to provide an integrated introduction to three crucial aspects of nanoscale work: the underlying science, possible scientific and engineering applications, and the societal implications of this still unfolding realm of science and engineering.

The US Co-sponsors for the symposium are: US Army Research Laboratory; US Army Research Office; Defense Advanced Research Project; Agency; Michigan Technological University; National Science Foundation.

The Indian Co-sponsors are:

- US Air Force Office of Scientific Research;
- Asian Office of Aerospace Research and Development
- Council of Scientific & Industrial Research
- Department of Science and Technology.

Printed and Published by V.K. Gupta on behalf of National Institute of Science Communication and Information Resources (CSIR),

Dr K.S. Krishnan Marg, New Delhi -110 012 and printed at NISCAIR Press, Dr K.S. Krishnan Marg, New Delhi -110 012

Editor: Dr B.C.Kashyap; Associate Editors: Meenakshi; Vineeta Singhal; Editorial Assistant: Neelima Handoo;

Design: Pradip Banerjee; Sarla Dutta; Production: Kaushal Kishore

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