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CSIR NEWS

Progress, Promise and Prospects

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C O N T E N T S

*Rifampicin — the TB Drug —
Acts as a Novel Glycation Inhibitor*



CSIR-NAL Technology Commercialized



CSIR's Enterprise Portal at NIO unveiled



*National Science Day Celebrations at
CBRI, CSIO, NEIST, NCL and NIO*



DG, CSIR Honoured



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Wishes
its Members a Very
Happy New Year 2010



A Breakthrough Project of CSIR The Birth of TKDL and Beyond

Dr P. Cheena Chawla



Open your grandmother's medicine box and you will invariably find it full of herbs or their parts: saunf, ajwain, pepper, haldi, tulsi, neem, and the list is endless. Strangely though, you will find that many traditional recipes, for countering a plethora of illnesses, simply work wonders. This knowledge has got passed down several generations only because the unique herbal formulations for treating the human body have given consistent results over the centuries. The ancient Indian wisdom of the usage of thousands of medicinal plants, in unique combinations and definite doses, is truly a blessing for keeping at bay the discomfort of many dreadful diseases.

The sanctity of our traditional knowledge is well established for it is codified in several classical ancient texts in the form of hundreds of thousands of Sanskrit *slokas* that mention scores of unique formulations of various herbs. This vedic knowledge — a handiwork of our sages and learned forefathers — is a treasure trove of information that unfortunately remained accessible to only a few experts, and long languished in the prison of ignorance of the common masses. Besides, the tribal and indigenous communities have also for long been the custodians of our country's rich biodiversity. Nonetheless, this enormous traditional wealth, collected

over millennia with some of it codified in a large number of old treatises of medicine, is a part of our rich legacy and belongs to India.

In modern times, with global resurgence of interest in herbal medicine, medicinal plants and their products are not just the source of affordable healthcare with minimal side effects, but are also important in terms of international trade and commerce. Realizing the potential of earning huge profits, many multinational pharmaceutical companies began to target the exploitation of traditional knowledge related to medicinal plants. To stop this exploitation, the need to protect the owners of traditional knowledge and provide them their rightful dues stemmed. It thus became imperative to safeguard the IPR on traditional knowledge.

A new era dawned when a US patent granted in 1995 for the wound-healing properties of turmeric was challenged successfully by CSIR. In a landmark decision, the United States Patent and Trademark Office (USPTO) revoked it after ascertaining the medicinal use of turmeric in India for centuries. This opened the floodgates for successful fights for the rights to



From turmeric to TKDL — The laudable effort of launching and operationalizing the TKDL Project surely comes to the rescue of our rich traditional wealth



neem and basmati rice, which firmly established the need to document our precious traditional knowledge for shielding it from the assault of wrongful grant of patents. Although these tough fights were won, a lot of time and funds were invested. Cancellation of the patent for turmeric took about two years while it took five years for revoking the patent on the anti-fungal properties of neem.

It thus became clear that it is possible to revoke the grant of wrong patents at international level and also exposed the fact that relevant information on traditional knowledge was not available to International patent examiners in a retrievable format. The need to systematize the documentation of knowledge existing in the public domain, on various traditional systems of medicine, thus assumed great significance for preventing the misuse of this knowledge through non-original inventions.

While considering the patentability of any subject matter, the patent examiners search available resources for non-patent and patent literature. Although patent literature is available in many databases that can be easily retrieved, non-patent literature normally appeared scattered. Thus arose the challenge to create non-patent literature databases, containing information on traditional knowledge that was easily accessible.

In this endeavour, CSIR was on the forefront as a collaborative Project — the Traditional Knowledge Digital Library (TKDL) — was initiated



Taking CSIR on the forefront : Dr. R. A. Mashelkar, former Director General CSIR, (right) and Shri V. K. Gupta, Senior Advisor and Director, TKDL, CSIR spearheaded the TKDL Project

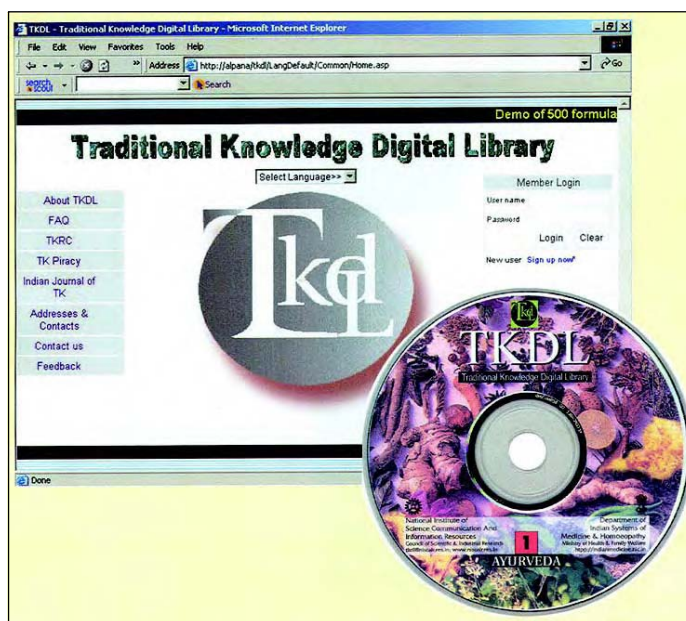
between the National Institute of Science Communication & Information Resources (NISCAIR) and the Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), erstwhile Department of Indian System of Medicine and Homoeopathy (ISM&H), Ministry of Health & Family Welfare. The MoU for this Project was signed

on 6 June 2001.

It all, however, started in June 1999 when the need for creating Traditional Knowledge databases was realized by the Standing Committee on Information Technology (SCIT) of World Intellectual Property Organization (WIPO), under the Chairmanship of Dr. R. A. Mashelkar, the then Director General of CSIR, India. A few months later, an Approach Paper on

setting up of TKDL was prepared by Shri V. K. Gupta, the then Senior Technical Director, National Informatics Centre, the former Director, NISCAIR who is currently the Senior Advisor and Director, TKDL, CSIR. This paper was submitted to SCIT, WIPO the same year.

In January 2000, an inter-disciplinary Task Force on TKDL,



The TKDL database essentially protects India's traditional knowledge from piracy. A demo CD on TKDL - Ayurveda (Inset)



consisting of experts from the then Department of ISM&H, Central Council of Research in Ayurveda & Siddha (CCRAS), Banaras Hindu University (BHU), National Informatics Centre (NIC), and Controller General of Patents Designs & Trade Marks (CGPDTM) was set up under the Chairmanship of Shri V. K. Gupta. In January 2001, the Cabinet Committee of Economic Affairs (CCEA's) finally gave approval on the TKDL Project — a triumph for the entire TKDL team.

Implemented at CSIR, the TKDL Project comprises an inter-disciplinary team of Traditional Medicine (Ayurveda, Unani, Siddha and Yoga) experts, patent examiners, IT experts, scientists and technical officers. The focus of this Project has been to create database on the codified traditional knowledge on Indian Systems of Medicine. For example, for documenting knowledge in Ayurveda, the available information in public domain was first searched, sifted and collated. The coded information lying dormant in the Sanskrit *slokas* was understood and converted into structured language using the specially created Traditional Knowledge Resource Classification (TKRC) and saved in the database by experts in the field.

The saved information can be read in five different languages (English, German, French, Japanese and Spanish) and is simple to comprehend. The TKDL software is special for it does smart translation, instead of mere transliteration, of Ayurvedic descriptions from traditional terminology into modern



India granted patent examiners of USPTO access to new digital TKDL database in 2009— (from left to right) are: Mr. V. K. Gupta, Director, TKDL; Prof. Samir K. Brahmachari, Director General, CSIR; Ms Sharon Barner, Deputy Under Secretary of Commerce for Intellectual Property, USPTO and Mr. Ajay Shankar, Secretary, Department of Industrial Policy and Promotion, Government of India

terminology.

Several thousands of herbal formulations from various Ayurvedic texts have been thus transcribed in patent application format. Similarly, traditional knowledge available in public domain, related to Unani, Siddha and Yoga, has also been converted to the user-friendly digitized format that is easily understandable. This TKDL database thus acts as a strong bridge between the traditional knowledge available in public domain and the patent examiners in various patent offices.

In yet another achievement in February 2002, about 200 subgroups on Traditional Knowledge on medicinal plants were included against the existing few besides the linking of TKRC to the International Patent Classification (IPC). Several specialized subgroups were later included as the Project advanced. A demo CD containing a sample of 500 formulations was released in October, 2003 by the then Hon'ble Union Minister

of Human Resource Development, Science & Technology, and Ocean Development at NISCAIR. Three years later, in a landmark achievement, the Cabinet Committee on Economic Affairs gave its approval on the access to TKDL database to International Patent Offices.

In the year 2009 access to TKDL database was given first to the European Patent office, and then to the Indian Patent Office (CGPDTM), German Patent and Trademark Office (DPMA) and more recently to the USPTO (*CSIR News*, Vol. 59, 15 & 30 December 2009)

under the respective TKDL Access Agreements. This allows the various patent offices access to about two lakh medicinal formulations on Ayurveda, Unani and Siddha, comprising a whopping 30 million pages! Following this, there have been innumerable cases of withdrawal of patent applications, where the subject matter was not considered to be original work due to TKDL *prior art* evidence.

With a cost of about 1.18 crore, the TKDL Project — a breakthrough that benefits the owners of traditional knowledge from theft of their knowledge — is a classic example of integrating the enormous capabilities of Information technology for creating mechanisms of effective access and retrieval of the rich traditional knowledge on medicinal plants collected over millennia, which in addition, has opened up new possibilities for further research. The success of TKDL Project has also opened the door for replicating this model for other countries.



Rifampicin — the TB Drug — Acts as a Novel Glycation Inhibitor

Finding a new use of the existing drug, also known as repositioning or repurposing of drugs in pharmaceutical parlance, has become an emerging approach in drug discovery in the last few years. Pharmaceutical companies have achieved a number of successes using drug repositioning, prominent examples being Viagra and Thalidomide. A significant advantage of drug repositioning is that the repositioned drug has already passed toxicity tests and its safety profile is known. However, drug repositioning faces some challenges as the intellectual property issues surrounding the original drug are complex.

A team of researchers from National Chemical Laboratory (NCL), Pune, and National Center for Cell Science (NCCS), Pune, led by Dr. Mahesh Kulkarni have found that rifampicin — an anti-tuberculosis drug — has a high glycation inhibition property. As inhibiting glycation is considered as one of the intervention strategies to prevent glycation-mediated diabetic complications, rifampicin would be very useful for diabetics. This work was carried out under NCL-IGIB joint research initiative.

Diabetes is characterized by high blood sugar level and this leads to the development of complications in the vital body organs such as eyes and kidneys, besides the nervous system. These complications arise mainly because of a non-enzymatic reaction between glucose and proteins called glycation. Glycation of proteins triggers a series of events leading to the formation of advanced

glycation end products (AGEs). The accumulation of AGEs results in the change in function of various proteins such as hemoglobin, albumin, IgG, collagen, crystalline and metabolic enzymes. In diabetic patients, the rate of AGE accumulation and extent of protein cross-linking is accelerated due to high blood glucose levels.

At present, there are no approved drugs that specifically inhibit glycation. Glycation inhibitors such as aminoguanidine and alagebrum chloride are not yet approved by drug regulators as these drugs have serious side effects.

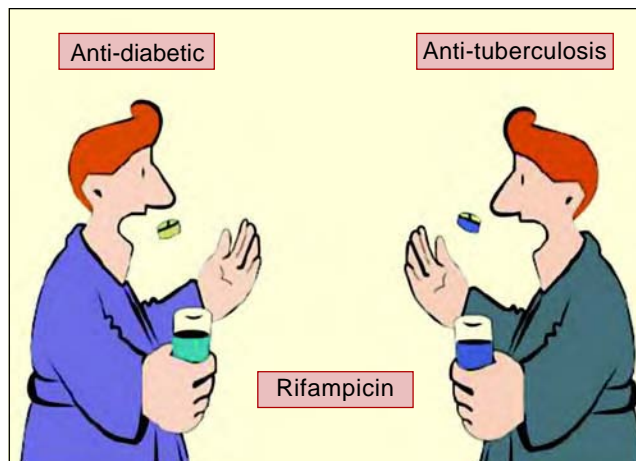
In this study carried out at NCL, a mass spectrometry based assay was developed for screening molecules that inhibit the glycation reaction. Insulin peptide was used as a model protein and was allowed to react with glucose *in vitro* leading to the formation of glycated insulin. Inhibition of the extent of formation of glycated insulin was monitored in the presence or absence of glycation inhibitors. The anti-tuberculosis drug, rifampicin, showed higher glycation inhibition than aminoguanidine, a known glycation inhibitor. These results were compared with another glycation inhibition assay using fluorescence spectrometer. Further, rifampicin is less toxic than aminoguanidine suggesting that rifampicin is a more potent glycation inhibitor. In a different

study, rifampicin showed inhibition to the retinal neovascularization *in vitro* and *in vivo* suggesting a role in anti-angiogenesis. The scientists attribute the anti-angiogenic property of rifampicin to the inhibition of glycation.

The scientists further caution that *in vivo* studies using experimental animal models are necessary to elucidate the exact mechanism of rifampicin-mediated glycation inhibition. The finding of an additional therapeutic property of rifampicin as a glycation inhibitor is very significant considering the fact that rifampicin is already an approved drug for the treatment of tuberculosis, and therefore, can be repositioned as a potent anti-glycating molecule for the treatment of diabetic complications, aging, and Alzheimer's disease.

Reference

Golegaonkar S.B., Bhonsle H.S., Boppana R., Kulkarni M.J., Discovery of Rifampicin as a New Glycation Inhibitor by MALDI Based Insulin Glycation Assay. *Eur J Mass Spectrom*, 2010, 16, 221–226.



Successful Closure of Life Cycle of Endangered Yellow Seahorse, *Hippocampus kuda* in Captivity

Following the successful breeding of the first generation (F1) of yellow seahorse by researchers of National Institute of Oceanography (NIO), Goa, during late 2008, the first birth of F2 generation juveniles (~100) is observed in early February 2010 after 380 days of growth. The F1 generation seahorse juveniles were raised on a diet of wild mixed zooplankton, *Artemia* and wild mysid shrimps.

Closing the complete life cycle of *Hippocampus kuda* in captivity from birth to adulthood with relatively fast growth rate, low mortality and early maturity (F2 generation) has now been achieved under this project funded by the Department of Biotechnology. The significance of the present research in completely closing the life cycle of this endangered seahorse species opens up avenues for commercial aquaculture and conservation initiatives.

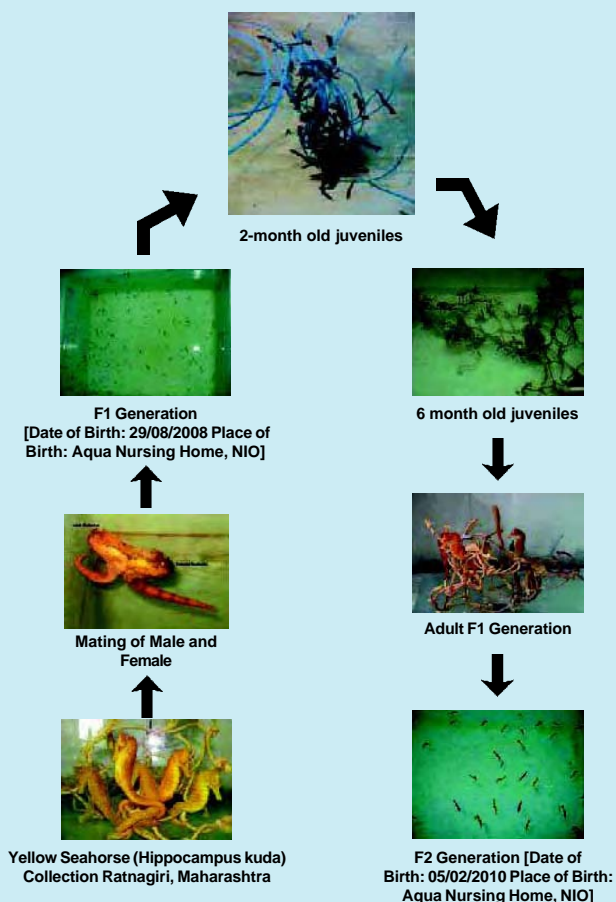
Seahorses constitute a fascinating group of fishes with their unusual body shape and biology, with males incubating the fertilized eggs in a brood pouch. They belong to the family, Syngnathidae. It has been reported that at least 25 million seahorses (> 20 metric tonnes, dried) are traded annually for traditional Chinese medicine (TCM), as aquarium fish and curios and nearly 77 nations and territories are involved in seahorse trade. India was contributing to about 30% of global seahorse trade until 2001 and now all species of seahorses have been brought under the schedule I of the Wild Life Act, 1972 to prohibit exploitation.

The oceanic yellow seahorse, *Hippocampus kuda* (Bleeker, 1852), is widely distributed throughout the tropical Indo-Pacific region inhabiting shallow inshore habitats such as mangroves, sea grass beds and estuaries. It is one of the most heavily traded seahorse species in many Southeast Asian countries for TCM and its conservation status is currently listed by the International Union for the Conservation of Nature (IUCN) as 'vulnerable'. As per the Convention of International Trade in Endangered Species (CITES), all species of seahorses have been placed under Appendix II, which states that captive breeding could be undertaken for stock enhancement programmes and aquaculture purposes.

Several attempts to culture seahorses for successive generations under captivity in the recent past have met with

limited success as a result of severe problems of mass mortality and low growth rates owing to inadequate nutrition and disease. Closure of the life cycle in captivity and production of the next generation of young has not been well documented. Improved seahorse husbandry and rearing could help reduce pressure on wild populations, by ensuring that those animals in captivity live for longer period and also create the possibility of trade. Successful life cycle experiments of yellow seahorse will help to facilitate the development of small-scale aquaculture farms by seahorse fishermen, as a viable alternative to capturing wild seahorses and conservation initiatives.

Steps involved in successful closure of life cycle of Yellow Seahorse, *Hippocampus kuda*, in captivity



Commercialization of CSIR-NAL Technology

Inauguration of Carbon Fiber Production Plant at M/s. Kemrock Ltd., Vadodara

Carbon fiber is a high strength and low weight material used extensively in aircrafts, missiles, launch vehicles and satellites. It is also an important raw material for many other industrial applications that include wind energy off shore structures and transportation.

Research and development activities aimed at developing manufacturing technology for carbon fibers has been carried out at the National Aerospace Laboratories (NAL), Bangalore. It is a multi-institutional effort as CSIR, DRDO and ISRO are the principal partners. A pilot plant for developing the technology has been established at NAL. Processed technologies for the manufacture of carbon fibers have been developed using this pilot plant facility.

Following successful development



A view of the dais

of carbon fiber technology, CSIR-NAL has transferred the know-how for commercialization purposes to M/s. Kemrock Industries & Exports Limited, Vadodara, an industry engaged in the manufacture of light weight composite products. Apart from providing basic know-how, NAL has actively contributed to the design of special equipments and machines for the production plant.

Based on the know-how transferred by NAL, M/s. Kemrock Limited has established a 400 tonnes/annum carbon fiber production plant. This plant was inaugurated on 9 May 2010 by Dr. A. P. J. Abdul Kalam, former President of India in the presence of Director General, CSIR and Secretary, DSIR, Scientific Advisor to Raksha Mantri, Secretary, Department of Defense

Research, Mr. Nitin Bhai Patel, Minister of Gujarat State for Water Resources and Urban Development and Director, NAL.

Inaugurating the plant Dr. A. P. J. Abdul Kalam appreciated the efforts of CSIR-NAL in developing the technology and complimented M/s. Kemrock Limited for deciding to commercialize the technology. Similar sentiments were expressed by the other speakers.



Glimpses of the Inaugural function of India's first Carbon Fiber Production Plant

Jaguar Nose Radome Fabrication Technology Handed Over to HAL

The National Aerospace Laboratories (NAL), CSIR, indigenously designed, developed and fabricated a composite nose radome for the Fire Control Radar of Jaguar Maritime Aircraft for HAL, Bangalore, end user being IAF. In continuation of the development of 11 nose radomes, a request was made by HAL-Overhaul Division for transfer of technology of the Jaguar Nose Radome fabrication. The TOT (Transfer of Technology) document was officially handed over to HAL by Director, NAL on 16 April 2010 in a small function held at NAL.

NAL had undertaken this Project with FRP Division as a nodal point and coordinating the overall activities with interdivisional participation by CEM Lab., ALD, Structural Technologies Division, CTFD and Engineering Services Division. HAL supported the fabrication and supply of all metallic parts, inserts and structural static tests. CABS supported in lightning protection tests. The vibration test was carried out at STTD, NAL. The radome had gone through a systematic development right from structural design, fabrication, full qualification tests, including flight tests and ATP tests on all production radomes.

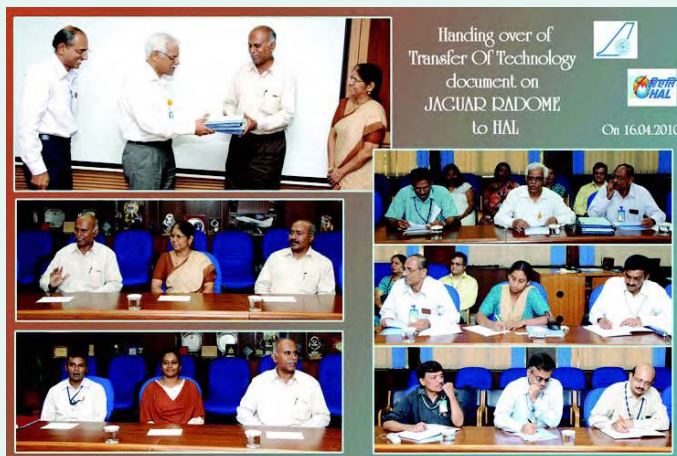
The radome has variable thickness nose thick and base thin design. An in-house developed closed mould resin injection technology has been used in the fabrication of radome. The composite radome is protected with anti-static/anti-rain erosion paint subjected to qualification tests, viz.,

EM, lightning protection, static loading, vibration and rain erosion tests.

From the HAL side, Wg. Cdr. M. P. Benjamin, DGM, Overhaul Division, received the TOT documents and mentioned that it was an auspicious day for both HAL and NAL. He stated that HAL is accepting technology transfer for the first time and expressed it as a honour to take the TOT document to HAL on behalf of their GM, Mr. K. G. Subramony.

In the light of IAF planning to deploy around 50 Jaguar aircrafts to its fleet with fire control radars, it is apt that this technology transfer of indigenously developed nose radome from NAL to HAL is befitting. Wg. Cdr. Benjamin stated that tentatively the first such radome should be ready by June 2011. He also assured that once the mirage aircrafts get inducted and serve the IAF, HAL may come back to NAL for indigenizing its radome.

Director, NAL congratulated the scientific team for the successful execution of a National Project leading to a technology transfer by CSIR-NAL to a Public Sector and in turn to the Nation's defence sector – the IAF.



TOT Document on Jaguar Nose Radome Fabrication handed over to HAL

Shri D.V. Venkatasubramanyam, Head, FRPD also spelt a word of appreciation to all those who were involved in this Project, including some of them who had superannuated. The team included Shri S. K. Veluswamy, Shri Ranganath Rao, Shri Sathyanarayan of HAL, Dr. S. Christopher of LRDE, Dr. R.M.V. G. K. Rao, Dr. S. Viswanath, Shri C. Chandrashekar and Shri Dwarakanath of NAL, Shri Majeed and Shri V. L. Raja of CRI-CEMILAC whose contributions were mentioned on this occasion.

The event was graced by Dr. Ranjan Moothithaya, Head, KTMD and team; Head, CTFD & team; Head, CEM Lab., ALD; Head, Engineering Services Division and the FRP team. It was a moment of pride for NAL as it also marked yet another milestone on the map of CSIR-NAL's achievements. The Jaguar Nose Radome Project team thanked the Director, NAL, on this occasion.

CBRI's Rice Husk Plastic Wood Technology Transferred

The Central Building Research Institute, Roorkee, has developed a technology know-how for manufacturing of plastic composites, used as a replacement of natural wood in buildings. This development has been made under the *Supra Institutional Project* of CSIR under the Eleventh Five Year Plan.



Prof. S.K. Bhattacharyya, Director, CBRI handing over the Know-how Document and Product to Mr. Bhupesh Khanna, Director of M/s Shivaye Namah Manufacturing Company Pvt. Ltd., New Delhi

In this work, rice husk is used as an alternative to wood fibres in melt blend processing because many users of wood fibres/residues often face local shortage due to environmental issues and Government policies. Rice husk is a low-cost renewable resource, which is locally available in a huge quantity.

Prof. S. K. Bhattacharyya, Director, CBRI stated that this product has been developed with rice husk and plastics under a specific condition of compounding/extrusion process to obtain composite profiles as comparatively similar to natural wood in surface appearance and carpenter-friendly properties. The credit of this work goes to Dr. B. Singh and Dr. Manorama Gupta of the PPC Division of the laboratory.

The composite profiles have been thoroughly evaluated as per market specification for various properties such as strength, dimensional stability, screw holding and nailing properties, besides termite attacks and fire. These products are designed to have a long-term durability. The composite profiles meet the requirements of the National Building Code, 2005, Section 3 Timber when tested as per IS: 1708. A patent on the product has also been filed.

For commercialization of this research output, the Institute has transferred the technology know-how to Mr. Bhupesh Khanna, Director, M/s Shivaye Namah Manufacturing Company Pvt. Ltd., New Delhi, for setting up of a commercial production unit. The manufactured profiles will be used for door and window profiles and frames, fencing, decking, furniture, structural support members and other industrial applications.

Besides, the Institute had earlier developed several wood substitute materials such as EPS door shutters, natural fibre composite door shutters, cement and gypsum bonded boards etc. Some of these products have also been commercialized.

Prof. S. K. Brahmachari Director General, CSIR, Unveils CSIR's Enterprise Portal at NIO



Prof. S. K. Brahmachari, Director General, CSIR, unveiled an Enterprise Portal at National Institute of Oceanography (NIO), Goa, and also the redesigned website of CSIR (<http://csir.res.in>) at a function (Goa Summit' 10) held at NIO, Goa on 30 April 2010.

The Enterprise Portal provides a platform to work seamlessly and efficiently for all laboratories together and collate internal information about CSIR for taking right decisions at right time. The Portal modules on HR, e-learning, policy formulation, e-procurement & facilities management, works & contracts and finance management will help R&D module to plan and execute projects and deliver results in a timely manner. Six corporate companies specializing in their respective fields have partnered with CSIR in making this Portal a reality, on a rapid prototyping approach within a time span of four months.

Prof. Brahmachari delivered an inspiring address on the occasion. The application is an outcome of a well planned strategy that has transformed the dream into action. It is hoped that the mass participation from every CSIR laboratory in populating the content on this Portal would make it vibrant.

The purpose of this two-day programme was to give sufficient exposure to the participants from all CSIR laboratories to the Portal and help work back home with added efficiency.



Advanced Aerospace Testing Facilities at NAL

The National Aerospace Laboratories (NAL), Bangalore, has specialized strengths/facilities and a competence base in Aerospace sector developed over the past few decades. The NAL is equipped with state-of-the-art test facilities that play a significant role in Aerospace Sector both at design and certification stages. The aerodynamics facilities of sizes varying from 0.3 m×10.3 m to 1.2 m×1.2 m cross sections with subsonic to Mach 4.0 test range. Every Indian aerospace vehicle has graduated through this facility complex.

New test facilities namely, Jet Acoustic Research Facility, and Co flow Jet Facility have facilitated advanced research in jet acoustics, Co flow jet and low Reynolds number flows. Low Reynolds number flow has a direct relevance to Micro Air Vehicle design & development. The High Performance Computing Facility is equipped with front end workstations and Personal Computers with many of in-house developed codes ranging from Panel code to LES (Large Eddy Simulation), applicable to a variety of flow regimes ranging from subsonic to hypersonic speeds.

The high end computing facilities can be used for both for aerospace and non-aerospace applications, flow visualization and grid generation materials and surface modifications research at NAL is backed by a state-of-the-art Field Emission Scanning Electron Microscope, EDS for elemental detection and for mapping of nanocrystals of different orientations. A modern computer-controlled fabric impregnation machine, tape laying machine and fibre stitching machine augment the composites facility along with the water jet cutting and ultrasonic NDT system.

MoU Signed Between CBRI, Roorkee & M/s Meta Dynamics, South Africa



Prof. S. K. Bhattacharyya, Director, CBRI and Mr. Gavin Coulson, Managing Director, Meta Dynamics, South Africa exchanging MoU documents

An MoU was signed between the Central Building Research Institute (CBRI), Roorkee, and M/s Meta Dynamics, South Africa on 15 March 2010 to formulate the super sulphated cement from their raw materials using fluoro gypsum and slag as per Indian Standards. Fluoro gypsum, a waste of hydrofluoric acid industry contains the impurities of fluoride and free acidity which adversely affect the setting and strength development of plaster and its products. For mass utilization of fluoro gypsum, it is necessary to remove and inactivate these impurities as far as possible. The $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ content of fluoro gypsum varies between 95 to 97 percent.

Granulated blast furnace slag is a glassy material having latent hydraulic properties. Extensive work has been carried out at CBRI, Roorkee, to make Portland slag cement and super sulphated cement (SSC). The SSC can be produced by activation of slag with 10-20% gypsum anhydrite/fluorogypsum anhydrite in the presence of 2.5-6% of cement clinker/lime. The SSC conformed to the requirements of IS: 6909, 1990. Some of the advantages of SSC over Portland cement are its low cost with saving in energy, increased resistant to sulphate and lower heat of hydration. It is eminently suitable for marine and mass concrete construction.

Research work has been carried out in the EST Division under the leadership of Dr. Mridul Garg to beneficiate and use of fluoro gypsum for making high strength plaster, water-resistant binder, flooring tiles, bricks and blocks and super sulphated cement.



Research Highlights of Dr. N. Jayaraman, Department of Organic Chemistry, IISc., Bangalore

A recipient of 2009 Shanti Swarup Bhatnagar Award, Dr. N. Jayaraman has contributed significantly in the major areas of (i) Carbohydrate Chemistry and (ii) Dendrimer chemistry. The emphasis of his work on Carbohydrate Chemistry has been on modifications of monosaccharides, synthesis of cluster glycosides, synthesis of oligosaccharides, unnatural sugars and glycolipids along with their biophysical studies in efforts to understand carbohydrate-protein interactions. As carbohydrates are amphiphilic upon suitable derivatizations, they provide a basis for exploring material properties, namely, properties associated with their mesogenecities.

In Dendrimers Chemistry, Dr. Jayaraman's investigations have led to the establishing of two new classes of dendrimers, namely, (i) poly(alkyl aryl ether) dendrimers and (ii) poly(propyl ether imine) dendrimers. Many new functions of these dendrimers were also established. The invention on poly(ether imine) series of dendrimers has been patent filed in a few countries and a license has been transferred to a pharmaceutical company for manufacturing, R&D development and commercialization of the dendrimer products.

The specific accomplishments are summarized:

Carbohydrate Chemistry

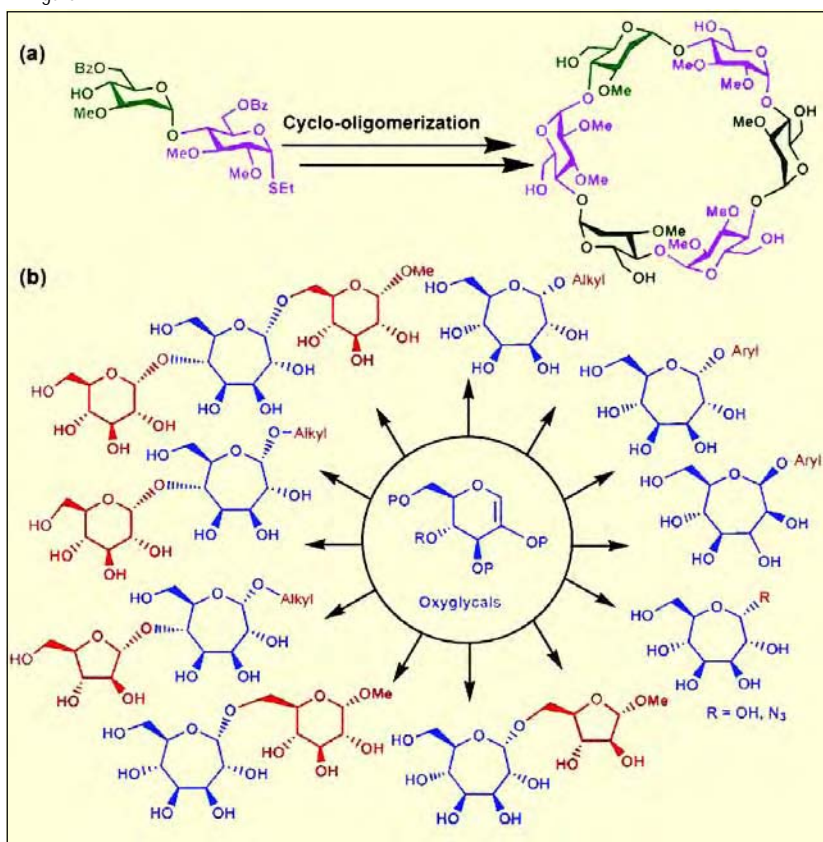
(i) Monosaccharide Modifications:

Development of new synthetic methods for monosaccharide modifications has been a major area of Dr. Jayaraman's research. Sustained research on monosaccharide modifications led to the establishing of new synthetic methods to prepare a variety of 2-deoxy glycosides. The 2-deoxy glycosides were also utilized to prepare 2-deoxy cyclic and linear oligosaccharides, which are new types of cyclodextrin and acyclic maltodextrin analogues, through a novel polycondensation method (Figure 1(a)). Further studies on monosaccharide modifications also facilitated resolving the single crystal structures of several monosaccharides, providing intricate molecular details of the monosaccharides in solid state.

(ii) Synthesis of Un-natural Sugars:

Recent synthetic efforts in monosaccharide modifications were focused on the synthesis of un-natural seven-membered septanoside sugars. The elegant synthetic methodology allows the synthesis of various alkyl, aryl, glyco-furanosyl, -pyranosyl septanosides. This method is a general strategy for the synthesis of septanoside oligosaccharides. (Figure 1 b).

Figure 1



represent first such efforts in the larger area of carbohydrate-protein interactions.

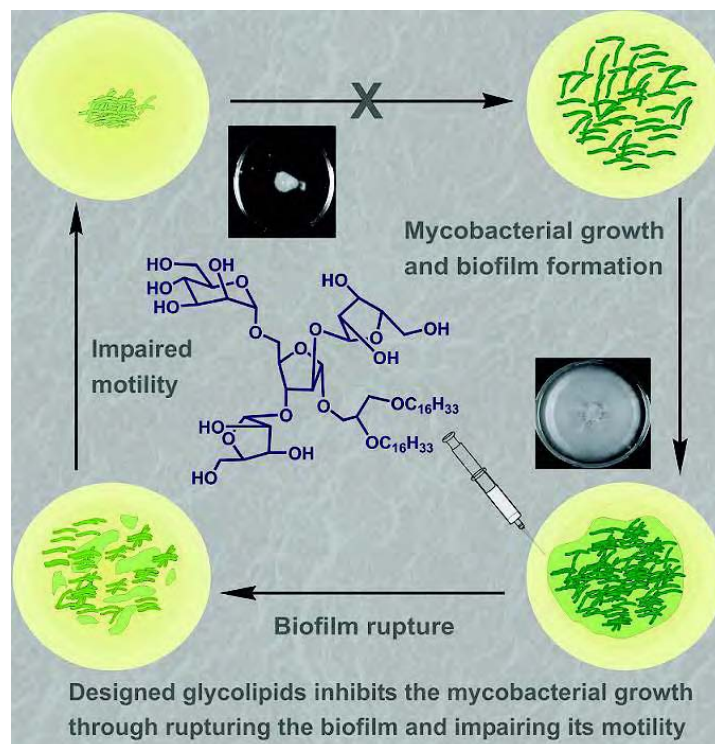
The concepts of multi-valent cluster glycosides are also being employed to study the mycobacterial pathogen related cell wall glycolipids. Glycolipids bearing lipoarabinomannan oligosaccharide glycolipids were synthesized, and studies in collaboration with Professor D. Chatterji, Molecular Biophysics Unit of the Institute, further demonstrated that the synthetic glycolipids are inhibitors of the mycobacterial strain growth (Figure 2).

(iv) Carbohydrate Liquid Crystals: The material properties of the clustered sugar amphiphiles and glycolipids contribute significantly, primarily in the area of the carbohydrate-based liquid crystals. The chiral nature of the sugars to generate chiral liquid crystals, having ferroelectric properties, were established for the first time, in a jointly funded project with Dr. Suresh Das,

Figure 2

(iii) Carbohydrate-Protein Interactions: Dedicated efforts were made to understand complex carbohydrate-protein interactions, with the aid of a large number of synthetic cluster glycosides and glycolipids. The possibility of photoswitchability in cluster glycosides, considered as the second generation cluster glycosides, was established. Important queries relating to the extent of the sugar clustering, the optimal distances between each sugar unit in the clusters, the extent of sugar epitope distribution on two-dimensional surfaces were addressed.

The kinetic studies of the interaction of multivalent ligands, in relation to their ability to mediate enhanced binding with relevant proteins, were assessed systematically. The nature of the bivalent binding of sugars to proteins and the kinetic on-off rates were also established, using surface plasmon resonance technique. These kinetic studies using synthetic cluster glycosides





National Institute for Interdisciplinary Science and Technology (formerly Regional Research Laboratory), Thiruvananthapuram. Further, the relation between the number of the hydroxyl groups in the sugars and the hydrophobic balances, in order for the mesophase properties to evolve, was established.

Synthetic Dendritic Macromolecules:

(i) Poly(ether imine) (PETIM) Dendrimers: In the newly evolved class of hyperbranched macromolecules, namely, dendrimers, Dr. Jayaraman and his team have made a dedicated research to establish the chemistry of these new types of macromolecules. The class of poly(ether imine) (PETIM) dendrimers (Figure 3) have chemical, physical and biological properties that are found to be superior, for example, in their effective topologies and sizes, and in vitro and in vivo toxicological properties. Many favorable attributes of the PETIM dendrimers has attracted the interest of industries, in order to develop dendrimer based technological applications. The divergent growth of their synthesis is amenable for industrial scale productions.

The discovery of an anomalous fluorescence behaviour of PETIM dendrimers is an important milestone in the studies on dendrimers. An anomalous inherent fluorescence behaviour of the PETIM dendrimers has been established, even when classical chromophores, unsaturation and

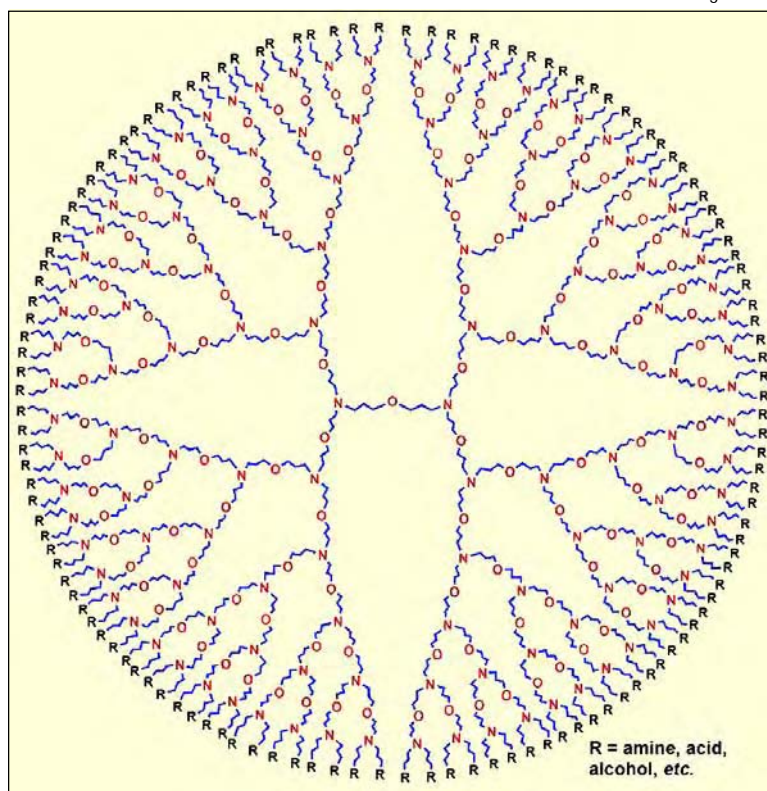
fluorophores are absent within the molecular structure. Inherent emission behaviour is unusual in literature at large. It has the potential for further studies on chemical and biological fluorescence-based sensors.

(ii) Dendritic Organometallic Catalysis: Dendritic organometallic catalysis were studied, by involving PETIM dendrimers as ligands for metal complexation. These dendritic ligand-metal complexes were used to mediate the C-C bond forming reactions. The relative turn-over-frequencies of dendritic catalysts and the beneficial effects of dendritic arrangements of the catalysts were established. An important finding on catalytic profiles in multivalent dendritic catalysts was established,

wherein it was identified that an individual catalytic site was far more efficient in its catalytic activity, when the site was present as a cluster within the molecule, as opposed to its presence as an isolated site. Functionalization of the silica matrix by PETIM dendrimers was established to increase the catalytic activities, as well as the recyclabilities of metal catalysts in metal mediated organic conversions.

(iii) Phloroglucinol-based Poly(alkyl aryl ether) Dendrimers: In another class, phloroglucinol-based poly(alkyl aryl ether) dendrimers were established. The endo-receptor properties arising from these dendrimers were also studied. Dendritic organometallic catalysis, representing

Figure 3





the exo-receptor properties of dendrimers, in organic transformations was established upon phosphination and ligand-metal exchange reactions. Organometallic studies were established for the multivalent dendritic Rh(I) catalysts, in hydrogenation, hydrosilylation and metal-mediated C-C bond forming reactions. These examples illustrated hitherto unknown beneficial multivalent effects in organometallic catalysis, wherein significant increases in the catalytic activities can be achieved with multi-valent, clustered dendritic catalysts.

Biographical Sketch

Dr. Narayanaswamy Jayaraman received B.Sc. (1984, University of Madras), M.Sc. (1988, Annamalai University), and Ph.D. (1994) from the Indian Institute of Technology, Kanpur, under the supervision of Professor S. Ranganathan. He was a post-doctoral fellow in the research group of Professor Sir James Fraser Stoddart at the University of Birmingham, UK, and at the University of California, Los Angeles, USA. He joined the Department of Organic Chemistry, Indian Institute of Science, Bangalore, in 1999. His research interests are mainly in the areas of Carbohydrate Chemistry and Dendrimer Chemistry. He is an author and co-author of 85 publications in peer-reviewed journals. For his outstanding scientific contributions in the field of chemical sciences, Dr. Jayaraman was honoured with Shanti Swarup Bhatnagar Award for the year 2009.



(E-mail: jayaraman@orgchem.iisc.ernet.in; Fax: +91 80 2360 0529; Tel: +91 80 2293 2578)

NAL Press Report on SARAS Released

The Directorate General of Civil Aviation (DGCA) released the final investigation report on accident of CSIR-NAL's Prototype-2 SARAS, the 14-seater Light Transport aircraft, on 21 April 2010. While CSIR-NAL was the Design and Development Organization for Prototype-2 SARAS, the flight testing was undertaken by the IAF with the help of flight test team at Aircraft System and Testing Establishment (ASTE), Bengaluru.

In a 75-page document several aspects of the programme and events that took place on the day of the accident and prior to that have been reviewed. Some of the relevant points in the report are as following:

□ CSIR-NAL is happy to note that there was no structural or

maintenance defects and that there was no evidence of any defect or malfunction due to maintenance. Also, there was no in-flight structural failure leading to the accident. Also, there was no malfunctioning of engine system.

□ There are some general issues related to controllability of the aircraft though they are not safety critical. This is common in all aircrafts with manual flight control systems. These are generally evaluated during flight testing phase and corrections/design modifications incorporated based on the flight test results. Often, additional wind tunnel tests/CFD/aerodynamic calculations are

carried out to confirm the adequacy of such design modifications. CSIR-NAL is going through this process and such modifications are being introduced in the production standard version of the aircraft (3rd prototype) which is expected to fly by end of this year.

□ The cause of the accident is attributed to incorrect relighting procedure in the DGCA report. It is clarified that the procedure adopted (as also stated in the report) is as per the Engine OEM's operating instructions.

On hindsight, it is accepted that the procedure, though as recommended by engine OEM, had associated with it certain unknown risks, particularly



at that time, that had implications on the control of aircraft, if the relight did not take place within a short time after initiation of the relight procedure in flight. The procedure given by the OEM is ambiguous and lacks clarity as stated in the report. Again, on hindsight, CSIR-NAL accepts that it should have consulted the propeller designer.

- With regard to outsourcing the design activities it is to be noted that the company, M/s ADES, consists of senior retired officials from ARDC of HAL with decades of valuable experience in aircraft design and development. The team only supports the CSIR-NAL team by working closely with them on site. All responsibilities lie with the officials of CSIR-NAL. It may be noted that ADES is also an approved

design organisation by DGCA for providing such a support to CSIR-NAL.

- CSIR-NAL and IAF-ASTE will study, in detail, the conclusions and recommendations indicated in the report and take necessary corrective steps that are required. It may be noted that a High Powered Expert Review Committee has been constituted by DG-CSIR with Dr. V. K. Aatre, former SA to RM and DG-ADA as Chairman, Air Marshal (Retd.) P. Rajkumar, former Director, ADA, as the Co-Chairman and members from HAL, DGCA, IAF CEMILAC, ADA, to review NAL's aircraft development and R&D programmes and to make suitable recommendations for strengthening the CSIR-NAL system. This Committee has already started its

deliberations from 3 May 2010.

- It may also be noted that CSIR-NAL is the only organization involved with design and development of civilian aircraft in this country and hence needs to be strongly supported to carry forward the development programmes on hand to their logical conclusions by plugging gaps in the system, if any. This, in fact, is the mandate given to Dr. Aatre Committee set up by DG-CSIR.

There are some comments in the report on the flight crew's actions. It is to be noted that the crew members are not alive to defend themselves and hence it would not be appropriate to pass judgement on these recommendations or debate on them in public. Actions, however, will be taken to review and correct wherever necessary.

Press Conference at CGCRI for Spreading Awareness on Age-related Arthritis

To make the common man aware of the solutions available to the age-related bone problems, the Central Glass & Ceramic Research Institute (CGCRI), Kolkata, organized a press conference on 30 of April 2010 in the Atma Ram Committee Room of the Institute. Prof. Indranil Manna, Director and Dr. D. Basu, Head, Bioceramics & Coating Division of CGCRI addressed the media on the breakthrough achieved by the Institute, on bone related ailments, in collaboration with other Institutes and

Hospitals of the country.

Speaking on the occasion, Prof. Manna said that the age-related problems are on the rise in India and contrary to the earlier social trend, people now aspire to lead an active life even at advanced age. Stating arthritis as one such disease, he said that although several treatment options provide short-term relief to the disease but a corrective or replacement surgery still remains the long-term cure.

There are thousands who can

benefit from joint replacement surgery but owing to the inadequate awareness and high costs, arising from the imported implants, only a small fraction in India can avail the treatment. With the support of several hospitals and laboratories in India, which includes the famous Sancheti Institute for Orthopaedics and Rehabilitation, Pune, and Jubilant Kalpataru Hospital, West Bengal, the Bioceramics & Coating Division of CGCRI over the last decade has undertaken extensive research to find



solutions alleviate the burden of this ailment.

Dr. D. Basu apprised the press that there was a shift to using bioceramic prosthesis all over the globe due to its longer and trouble-free life-span compared to the conventional metal/polycarbonate prosthesis. “Over the last ten years, several patients have gained from CGCRI made bioceramic prosthesis, which has encouraged the Institute to develop a complete Bioceramics Prosthesis Solution for Hip Surgeries under the CSIR’s New Millennium Indian Technology Leadership Initiative (NMITLI)” said Dr. Basu. In this programme, initially CGCRI’s collaborators were Central Mechanical Engineering Research Institute (CMERI), Durgapur, and the All India Institute of Medical Sciences (AIIMS), New Delhi. The Institute could thereafter expand the collaboration by successfully attracting *Padma Shri-Padma Bhushan* Dr. K. H. Sancheti, who is the Chairman and Chief Orthopaedic Surgeon of the famous Sancheti Institute for Orthopaedics and Rehabilitation, Pune, and the Jubilant Kalpataru Hospital.

The indigenously developed prostheses are designed to meet the postural requirements of Indian patients and are much cheaper as compared to the imported implants. Dr. Sancheti has been using such bioceramic prostheses for a long time and has also indigenously developed a knee joint implant. The Jubilant Kalpataru Hospital is in the process of building a network of seven hospitals in the district towns of West Bengal, in addition to the two hospitals it already has at Behrampore and Barasat. The good news is that these protagonists have now joined hands to provide modern health care innovations to the people at large.

This was indeed the second Press Conference staged in CGCRI in recent times after the one on 25 October 2009 that was held over signing of an Agreement for transfer of process know-how on ‘*Application of Bioactive Coatings on Orthopedic Dental Implants*’ with IFGL Refractories Limited, Kolkata. The signing took place in the presence of Prof. Samir K. Brahmachari, Director General, CSIR, Smt. Sheila Sangwan, IRS, Financial Adviser, CSIR and the senior officials of both CGCRI and IFGL Refractories Ltd. respectively.

CGCRI Organizes Workshop on *Energy Conservation Opportunities Available in Glass & Ceramic Industries in Gujarat*

For assessing the present situation of energy consumption in different ceramic industries, the outreach centre of CGCRI at Naroda organized on 7 January 2010 a Workshop on “*Energy Conservation and Opportunities Available in Glass & Ceramic Industries in Gujarat*” jointly with Petroleum Conservation Research Association (PCRA), Ahmedabad. Twenty six participants from different ceramic industries of Ahmedabad region attended the Workshop.

At the outset, Dr. S. N. Misra, Scientist-in-Charge of the outreach centre welcomed the speakers, guest and participants and emphasized on the importance of the Workshop for the benefit of ceramic industries. Speaking on the occasion, Shri Anupam Shrivastava, Joint Director, PCRA described the objectives of PCRA and the details of its various programmes. He stressed on the need for energy savings through use of non-conventional energy. Shri Vijay Bariwal, Asst. Director, PCRA highlighted the importance of energy audit in selective industries with the help of CGCRI for efficient consumption of energy.

During the presentation sessions, Dr. Mishra explained how reduction of carbon emission in the existing process could be covered under Kyoto protocol while Mr Anupam Shrivastava spoke on the measures to reduce CO₂ emission from the existing process of firing. He explained the advantages of oxygen-rich fuel in firing of ceramic and glass products. Mr. Amrut Patel, a kiln specialist, explained the advantages of the roller kiln. All the industry participants showed keen interest and interacted enthusiastically during the deliberations.



National Science Day Celebrations at CBRI, CSIO, NEIST, NCL and NIO

Central Building Research Institute CBRI, Roorkee

CBRI celebrated National Science Day (NSD) on 28 February 2010 to commemorate Raman Effect of the Nobel Laureate, Sir C.V. Raman. The celebration of the day offers an opportunity to bring issues of science in the centre stage and create public awareness about such issues. Prof. S. K. Bhattacharyya, Director, CBRI, narrated the contribution of Sir C.V. Raman in the field of Spectroscopy for a wide range of scientific investigations and industrial applications. He stressed the role of NSD's objectives in transforming our society under the theme of 'Gender Equality for Prosperity and Peace'.

CBRI is pursuing faculty training and motivation for school and college faculty and students – A programme of CSIR to create interest, excitement and excellence in science education at the school and undergraduate level to raise the standard of science education and capabilities. Prof. Bhattacharyya felt

that it is an opportunity to take stock of the status of science in India. Such introspection is necessary as science and technology have become the most important drivers of economy of the country.

On the occasion, Prof. I. S. Tyagi, Department of Physics, IIT, Roorkee, delivered National Science Day lecture on: *Fascinating World of Quantum Physics and Nanotechnology*. His lecture contents on *Basics of Raman Effect, Essentials of Quantum Mechanics, Carbon Nanotubes, High-Tc Superconductors and Structure of Semiconductors* are widely appreciated by scientists and college students. He, along with Prof. S. K. Bhattacharyya interacted with college students on the models and charts prepared by them at CBRI during the training. On the occasion, the R&D activities being carried out at CBRI were displayed.



Prof. S.K. Bhattacharyya addressing on the National Science Day



Prof. S. K. Bhattacharyya and Prof. I. S. Tyagi interacting with college students at display of project work

Central Scientific Instruments Organization, (CSIO), Chandigarh

CSIO celebrated National Science Day (NSD) by organizing the National Science Day Lecture on 26 February 2010. Dr. Ashwagosh Ganju, Director, Snow & Avalanche Study Establishment, Chandigarh, in his talk on 'Snow Study for Avalanche Defence & Climate Change in Himalaya' emphasized that snow is an important

constituent of Earth's crust and it modulates weather conditions, initiates formation of glaciers, regulates water flow in various river systems, maintains water balance and is an intriguing material for scientists since in the slopes it can cause avalanches that can cause destruction to life and property. He stressed upon the need of sensors and

instruments for continued recording to study the climate change. He also stressed that strengthening environmental protection should be an important issue for all humans.

Dr. Ganju explained various avalanche control structures such as snow nets, snow bridges, snow rakes, diversion walls/dams, snow shed/gallery,



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wedges, terraces, catch dams, retarding structures and earthen mounds etc. He traced about many new surveillance techniques such as unmanned arial vehicles fitted with lidars. He also revealed the challenges and opportunities in this field to take up systematic and long term study with state-of-the-art equipment and provided authentic analysis from accurate data for government to take up sustainable development programmes and adaptation strategies in mountains.

In the end, Dr. Ganju urged all to live in harmony with Nature and preserve it to avoid such calamities. He further stressed on the synergic approach to have a holistic view of the entire problem through the convergence of various technologies.

During the day, all the labs of CSIO were kept open for general public. A large number of visitors including students from various schools, colleges, universities and general public went around the laboratories of the organization. They interacted with the scientists and were given exposure to

the technologies developed and being developed at CSIO.

Earlier, Dr Pawan Kapur, Director, CSIO, while welcoming the Chief Guest highlighted the significance of National Science Day and said that scientific methodology is required in every walk of life and also highlighted the achievements of CSIO.

The programme was coordinated by Shri N. S. Aulakh. Shri N. S. Mehla, Senior Scientist, proposed a Vote of Thanks.

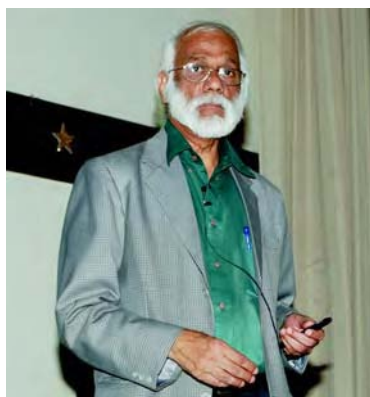


Dr. Ashwagosha Ganju delivering the National Science Day Lecture



Students interacting with a scientist in a CSIO laboratory

National Chemical Laboratory (NCL), Pune



Prof. G. Padmanaban delivering the talk

Prof. Govindarajan Padmanaban, FNA, former Director, Indian Institute of Science (IISc), Bangalore and Honorary Professor and distinguished biotechnologist at IISc, delivered a lecture on '*Drugs and Drug Targets Against the Malarial Parasites*' on the occasion of the National Science Day celebrations at National Chemical Laboratory (NCL), Pune, which was held on 27 February 2010.

While giving an introduction about

malaria, Prof. Padmanaban spoke on morbidity and mortality associated with malaria. There occurs more than a million deaths due to malaria. The four species of the malarial parasite are: *Plasmodium falciparum*, *P. vivax*, *P. ovale* and *P. malariae*. Out of them, *P. falciparum* is the most deadly parasite, which along with *P. vivax* is the causative agent of most cases of malaria.

Prof. Padmanaban spoke on the



available drugs, and their targets, against the malarial parasites. He apprised the audience that the malarial parasite has developed resistance to the frontline anti-malarials, such as, chloroquine and anti-folates (sulfadoxine and pyrimethamine). Artemisinin and its derivatives (ART) are, however, quite effective anti-malarial drugs. Therefore, there is a need to discover and develop new anti-malarials.

Prof. Padmanaban explained the life cycle of the malarial parasite. He said that the molecular and cellular events during the parasite's life cycle in the human body influence the severity of the disease. The asexual blood stage where the parasite leaves the liver and begins to invade and grow inside red blood cells (RBCs) is crucial to disease development. Although all the four species of *Plasmodium* invade by the same mechanism, *P. falciparum* reaches quite high parasitaemia because of greater flexibility in the receptor pathways that it employs to invade the RBCs.

Prof. Padmanaban described the various types of anti-malarial drugs and their combinations available. He also briefed on the advantages and side effects of these drugs. He detailed the audience on the number of deaths caused due to malaria and the percentage of roll-back effect of malaria on the patients. His pictorial presentation of drug target area on the organs of the human body drew attention to the sites of current anti-malarial drug action and new targets under investigation.

While speaking on the parasite's genome and the various enzymes coded by it, Prof. Padmanaban compared parasite's PfPBGD enzymes,

(porphobilinogen deaminase), a bifunctional enzyme with the host PBGD. He said that the parasite enzyme was slow as compared to that of the host in order to reach the blood cells of the host. He discussed the specific role of mitochondrial electron transport in blood-stage of *P. falciparum*. He discussed models for the heme synthesis in *P. falciparum* and described heme synthesis in different stages of parasite development. He said, that the apicoplast enzymes involved in heme synthesis can be looked upon as drug targets. Prof. Padmanaban also highlighted the main cause of the increase in malarial deaths because of drug resistance, which occurs due to continuing use of outdated drugs, such as chloroquine and sulphadoxine-pyrimethamine, which are largely ineffective in most parts of Africa.

Prof. Padmanaban briefly discussed various projects for the development of new anti-malarials. He also emphasized the mechanism of action of curcumin and artemisinin derivatives and their clinical trials. He demonstrated the efficacy of artemisinin-class combination therapies (ACTs) by showing that 90% of patients could be successfully treated in just three days by adding artemisinin compounds to standard drug regimens (International Artemisinin Study Group, 2004).

Another natural compound called curcumin is known to have a broad spectrum of activity in different cell types. It is reported to have anti-oxidant, anti-inflammatory, anti-carcinogenic and apoptotic activities. Many of these processes are regulated by calcium and involve a variety of kinases, and curcumin is known to inhibit these enzymes. He described the anti-malarial

activity of curcumin in a rodent model. Curcumin can lower artemisinin dosage and bring down the drug cost as it is quite cheap. Strategies are today available to increase the bioavailability of curcumin and a clinical trial to this effect has also been launched.

Prof. Padmanaban concluded that most of the drugs available, including combination therapies suffer from problems such as resistance, toxic side effects, pharmacokinetic mismatch and above all, the cost. The development of resistance by the parasite against first line and second line anti-malarial drugs, has underscored the importance of developing new drug targets and pharmacophores to treat the disease. The absence of a potent malaria vaccine has made the situation even more serious. However, with advances in malarial research, a variety of drug targets and candidate molecules are now available for further development.

Earlier, Dr. S. Pal, Head, Physical and Materials Chemistry Division, welcomed Prof. Padmanaban and briefed his credentials. Dr. Pal described Prof. Padmanaban as a renowned biochemist and a pioneer in Indian biotechnology. Prof. Padmanaban's main interests are in elucidating the multifaceted role of heme in cellular processes where his team discovered the heme-biosynthetic pathway in the malarial parasite and showed it to be a drug target. Prof. Padmanaban has been widely recognized for his contributions to biochemistry specially to molecular biology related to malarial parasite. He is a recipient of many awards including Shanti Swaroop Bhatnagar Prize for Science and Technology (1983), *Padma Shri* (1991) and *Padma Bhushan*



(2003) and is an elected fellow of all the learned science academies.

The National Science Day was celebrated on 25th and 26th February 2010 by display of posters on various topics of research undertaken at NCL. Several lectures were delivered by NCL scientists on this occasion. Speaking about the two-day celebrations of Science Day in the laboratory, Dr. Pal encouraged research students to participate in the poster

sessions. There were 160 posters from various areas of chemical sciences.

The Science Day celebrations concluded by presentation of awards by Prof. Padmanaban. *Dr. Rajappa Award* for Best Publication in Organic Chemistry having the highest impact factor was awarded to Ms. Seema Bagmare and Mr. V. Srinivasa Rao. The *Gupta-Pardeshi Sainani Award* for the Best Research Papers in Biological

Sciences was awarded to Mr. Mukund Adsul. *Dr. Krishnan Award* for the Best Publications in Physical and Materials Sciences was awarded to Mr. Anuj Kumar. Besides these, *Keerthi Sangoram Endowment Award* for Best Research Scholar was awarded to eight students with a cash prize and a citation. Finally.

The Vote of Thanks was proposed by Dr. Pal.

North East Institute of Science & Technology (NEIST), Jorhat

NEIST celebrated the National Science Day (NSD) on 26 February 2010. The Programme was largely attended by special invitees from different government and educational institutions, besides a galaxy of scientists from other R&D institutions and NEIST. Dr. B. G. Unni, Scientist G, Area Coordinator, Biological Sciences & Coordinator, National Science Day welcomed all delegates and members present.

Prof. Parul Chakrabarti, Emeritus Scientist of Bose Institute and Bengal Tuberculosis Association, Kolkata, delivered the National Science Day Lecture on '*Biotechnology in the 21st Century: Prospects and Promises*'. She mentioned that Biotechnology is the key technology of the 21st century. The modern gene technology comprises a series of strategies and methods for the study of the genetic make-up of organisms and its relevant biological functions. Therefore, modern



A view of the dais

biotechnology is a scientific and technical development trend which is at the beginning of its technological and economic life cycle.

Prof. Chakrabarti also cited some examples of ancient biotechnology existing during 2,000-4,000 B.C.—beer making, wine making, bread making, cheese making, improved species of crops and animals by cross pollination or cross breeding—and other examples of modern biotechnology in the 20th century namely; Isolation of the

antibiotic penicillin from the mold *Penicillium* (Alexander Fleming, 1928), insertion of a piece of toad DNA into the bacterium, *E. coli* (Boyer and Cohen, 1973), and production of insulin, erythropoietin (blood production factor) and interferon-alpha through genetic engineering.

The sub-disciplines of modern biotechnology are — 'Red biotechnology' which involves medical processes such as getting organisms to produce

new drugs, or using stem cells to regenerate damaged human tissues and perhaps re-grow entire organs; 'White (also called gray) biotechnology' involving industrial processes such as the production of new chemicals or the development of new fuels for vehicles; 'Green biotechnology' which applies to agriculture and involves such processes as the development of pest-resistant grains or the accelerated evolution of disease-resistant animals; and 'Blue biotechnology' which is rarely



mentioned, encompasses processes in marine and aquatic environments, such as controlling the proliferation of noxious water-borne organisms.

Earlier, Dr. R. C. Boruah, Scientist G in his Inaugural speech welcomed all the members and apprised them of different collaborative R&D efforts being pursued with sister CSIR institutes as well as with institutes from abroad. He mentioned the contribution of NEIST in different spheres for the

upliftment of science and society. In his speech, he emphasized the need to inculcate scientific temperament in young minds and informed that NEIST has been conducting programmes on familiarization of science to young students under the CPYLS each year. NEIST has produced 270 Ph.D. students so far and has 2700 publications in national and international journals of high repute since inception.

Dr. Tarun Ch. Borah offered the

Vote of Thanks to the President Dr. R. C. Boruah, Chief Guest Prof. Parul Chakrabarti, Dr. B. G Unni, Senior Scientists, all the invited dignitaries of different Institutes, laboratories and Government offices. He also extended his thanks and appreciation to all the members directly and indirectly associated with organizing this event successfully. Later the students from different schools and colleges visited the different divisions of the laboratory.

National Institute of Oceanography (NIO), Goa

National Science Day (NSD) in Goa is always celebrated by participating in the Goa Science Centre's three day event "Science Fiesta" where all scientific organizations in Goa come together and display their exhibits. This provides an opportunity to the enthusiasts to see and understand what is happening in the scientific world of Goa. This event attracts the citizens and tourists visiting Goa besides the student community of various ages/groups.

NIO on the occasion of NSD exhibited the innovative technologies viz., Autonomous Underwater Vehicle (AUV), and Vertical Profiler besides the decolourization and detoxification of molasses spent wash technology developed using marine fungus, enzymatic technology for de-inking of used photocopy paper and also products developed using extracts from marine organisms for cosmetic and pharmaceutical industries. The exhibit centre of NIO also screened a three minute film on the ballast water treatment concept illustrating trapping and destroying of larval forms that are released along with ballast.

These exhibits were also displayed at another event called "*Festival Quark - 2010*" organized by BITS-Pilani, Goa, campus in early February. Both these events attracted the visitors and enthused their interest in oceanographic research.



A view of the exhibits displayed on the National Science Day, Goa



Dr. Chitra Mandal Elected Fellow of The Indian National Science Academy

Dr. Chitra Mandal, Scientist G, Indian Institute of Chemical Biology (IICB) Kolkata, has been elected as the Fellow of the prestigious Indian National Science Academy (F.N.A.), India, in 2010 for her contributions to the field of Glycobiology/ Glycoimmunology in health and diseases.

The main theme of her research is to understand the mystery of glycosylation of biomolecules through proteomic and glycomic approaches and their potential applications in medical research. Her research team has established *O*-acetylated-sialoglycolipids and sialoglycoproteins on lymphoblasts as universal biomarkers in childhood acute lymphoblastic leukemia (ALL). The high level of *O*-acetylated-sialoglycoconjugates, characteristics of ALL has been used for the detection of minimal residual disease, which is still a challenge in leukemia research. ALL-associated antibodies were also used for monitoring the disease status. She has demonstrated that both these newly induced antigens and antibodies help the lymphoblasts to survive by avoiding apoptosis.

Dr. Mandal has established a new era of cellular signalling in paediatric leukaemia. During exploration of a few herbal compounds for their anti-leukemic activities and deciphering the cell-signaling pathways, she has identified a few putative target molecules.

Her other notable contribution is the demonstration of modified



sialoglycoproteins exclusively induced on erythrocytes of patients with visceral leishmaniasis (VL). Based on this, a diagnostic technique for VL has been designed which is helpful in disease monitoring. She has also observed a specific derivative of sialic acid on parasites as a virulent factor, that is absent in host and may be useful as a drug target.

Demonstration of disease-associated glycosylated molecular variants of human C-reactive protein (CRP) in different pathological conditions is yet another outstanding achievement of Dr. Mandal. This molecular variant of CRP could be used as a potential biomarker. The role of these glycosylated molecular variants in complement activation deciphering innate immunity has been observed.

Dr. Mandal has several Honours and Awards to her credit. She is a Fellow of The Indian Academy of Sciences (F.A.Sc) since 2005, Fellow of The National Academy of Sciences (F.N.A.Sc), since 2004, and West Bengal Academy of Science and

Technology (2010) for her contribution to the study of glycosylation of biomolecules specifically induced during childhood ALL, VL and role of glycosylated CRP in innate immunity and their applications both in applied and basic medical research.

She had been the recipient of the *Senior Scientist Oration Award* (2008) by Indian Immunology Society for her overall contribution to Immunology, *BioTech Product and Process Development and Commercialization* (2005) Award by DBT for the transfer of ELISA-based diagnostic technology for the detection of alphafeto protein, an oncofetal antigen, *Kshanika Oration Award* (2002) by ICMR for the transfer of antigen-based diagnostic technology for diagnosis and monitoring of patients with VL, *P. B. Rama Rao Memorial Award* (2001) by the Society of Biological Chemists for her contribution to the field of leukemia research and *Smt. Chandaben Mohanbhai Patel Industrial Research Award* (2000) by Vividhlaxi Audyogik Samshodhan Vikas Kendra (VASVIK) for her overall contribution to the biomedical field.

She has successfully transferred three diagnostic technologies to companies. She has made significant contributions to research that include >100 research papers, reviews in International and National journals, chapters in textbooks and several patents.



A Befitting Honour for Director General, CSIR

STAND Magazine, in one of its recent issues, has brought out an article 'Six Leaders of the New Knowledge Society Movement in India.' It is a matter of pride that Dr. S. K. Brahmachari, Director General CSIR was selected by the Editorial team of this magazine, as one of the six individuals who are considered to be shaping India's destiny in the 21st century.

The other five persons selected for this honour are Dr. M. S. Swaminathan for his contributions to agricultural science that have left an everlasting imprint on food production in India and elsewhere in the developing world; Mr Nandan Nilekani, Chairman, Unique Identification Authority of India

(UIDAI) whose efforts are poised to bring the benefits of Information Technology to every single Indian; Mr Ratan Tata for launching the much awaited affordable car: *Nano*, which is an outstanding example of how innovation and technology have been used to change the lives of millions; Mr Kapil Sibal, Minister for Human Resource Development, Govt. of India for his vision that he has outlined to change India's education scenario, beginning from primary to high-end research, and



Dr. A. P. J. Abdul Kalam, the former President of India, for his untiring campaign to interact with children across the country and encourage them to think creatively.

Dr Brahmachari makes it to this list because of his staunch support for open source research which has culminated into an ambitious project headed by him: the *Open Source Model for Drug Discovery*. The Project seeks to provide affordable healthcare to the developing world by providing a global framework where the best minds can collaborate and collectively strive to solve complex problems associated with discovering new therapies for neglected tropical diseases like malaria and tuberculosis.

Dr. C.V. Chalapati Rao gets World Environmental Management Award

Dr. C.V. Chalapati Rao, Scientist and Head, Air Pollution Control Division, National Environmental Engineering Research Institute (NEERI), Nagpur, has been conferred 'World Environmental Management Award' for his significant contributions

to the area of pollution control and sustainable development. The Award was given away jointly by The Educational Standards and Testing Council of India (TEST-COIN), The Global Open University, Nagaland and The Confederation of Indian

Universities, New Delhi, on the auspicious occasion of the World Management Congress during 30-31 December 2009 at India International Centre, New Delhi. Various national and international dignitaries were present on this occasion.

Dr. (Mrs.) Asha A. Juwarkar elected Fellow of National Academy of Sciences

Dr. (Mrs.) Asha A. Juwarkar, Scientist and Head, Environmental Biotechnology Division, National Environmental Engineering Research Institute (NEERI), Nagpur, has been elected the Fellow of the prestigious National Academy of Sciences in 2009, for her outstanding contributions to environmental biotechnological research in the country. She has several patents to her credit, and has published research papers in national and international journals.



NINTH CSIR DIAMOND JUBILEE INVENTION AWARD FOR SCHOOL CHILDREN (CDJIA-2010)

Council of Scientific & Industrial Research (CSIR) is the premier industrial R&D Organisation in India. On the occasion of its Diamond Jubilee in 2002, CSIR initiated invention Awards for school children to create awareness, interest and motivation for intellectual Property amongst children.

On the occasion of the World Intellectual Property Day which is celebrated through out the world on 26th April, CSIR invites applications for the '**Ninth CSIR Diamond Jubilee Invention Award (CDJIA) for School Children-2010**'. The first prize winner would also become eligible for WIPO's Young inventor Award carrying a medal and a certificate.

Applicant must provide the details of the invention submitted for the award in not more than 5000 words in English/Hindi including an abstract (in not more than 100 words), authenticated (by giving seal and date) and sent through the Principal/Head of the School where the student is enrolled and personal details on a separate page as follows:

Title of the Invention, Name, date of birth, school and residential address, class, telephone no. (residence/school), e-mail address.

In case of proposals already selected for state, national, international or equivalent Awards, only the subject matter covering the improvements need to be submitted for consideration of CDJIA-2010. Published inventions would be considered as per the provisions of the Indian Patents Act.

The applications for the award not exceeding 5000 words in **English/Hindi** with requisite drawings will be considered. The write-up must describe the subject matter in a problem-solution mode and highlighting the novel and non-obviousness feature of the invention and its advantages.

Any Indian student enrolled in an Indian school below the age of 18 years as on 31st July 2010 can apply.

The invention submitted should be one that is globally novel, non-obvious and utilitarian. It could be a new concept or idea or a solution to an existing problem or completely a new method/process/device/utility. It is not essential/necessary that the invention should have been worked, only the concept of the invention should have been proved through a model, a prototype or experimental data. Details of any assistance/guidance provided by teachers/parents/friends or others must be appropriately mentioned and acknowledged.

Typed applications to be sent by Registered post/Courier to: Head, Intellectual Property Management Division, CSIR, NISCAIR Building, 14 Satsang Vihar Marg, Special Institutional Area, New Delhi-110 067 with the enveloped marked on top left hand corner 'CDJIA-2010'.

You may also send application through email addressed to head.ipmd@niscair.res.in. **However, a hard copy should also follow through post with Principal's authentication.**

The awardees will be selected by a high level Award Selection Committee. If required, the short listed candidates may be called for Interview at Delhi or at any other appropriate place. **The decision of the Awards Selection Committee/CSIR will be final and binding on the applicants and no enquiries/correspondence in this regard will be entertained.**

Applications received
on or before

31st October 2010

will be considered
for the Award

Prizes

There are in all 60 prizes. Besides a certificate, the cash awards are:

First Prize (1 No)
Rs. 50,000/-

Second Prize (2 Nos)
Rs. 25,000/- each

Third Prize (3 Nos)
Rs. 15,000/- each

Fourth Prize (4 Nos)
Rs. 10,000/- each

Fifth Prize (50 Nos)
Rs. 5,000/- each

**The Awards will be announced on January 1, 2011
at New Delhi and would be communicated to the Awardees only**



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Phone: 25846301; **Fax:** 25847062; **E-mail:** pchawla@niscair.res.in; pcheena@gmail.com; meenakshi@niscair.res.in;

Website: <http://www.niscair.res.in>

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