

CSIR NEWS

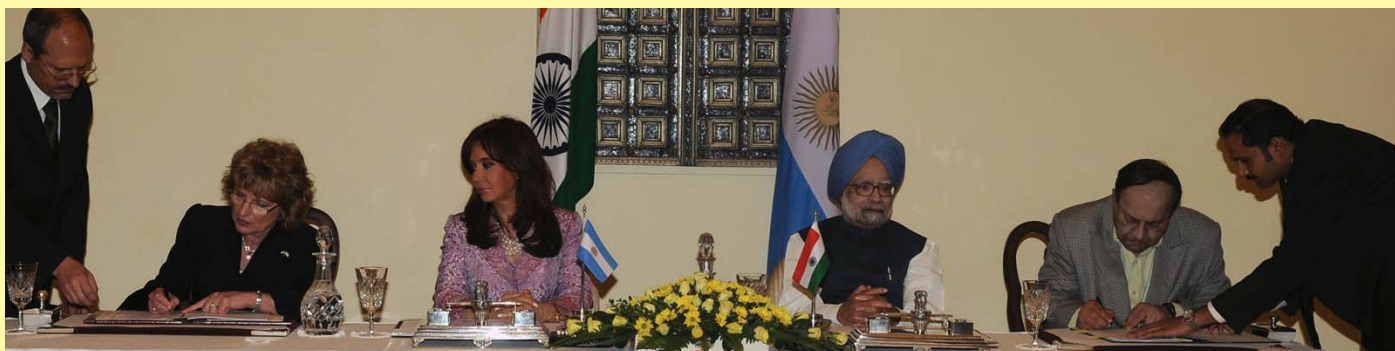
ISSN 0409-7467



VOL 59 NO 23 & 24 15 & 30 DECEMBER 2009



CSIR Signs Agreement With CONICET, Argentina



Dr. (Ms) Marta Rovira, President, CONICET and Prof. Samir. K. Brahmachari, Director General, CSIR, signing the Agreement on behalf of CONICET and CSIR respectively in the presence of Dr. Manmohan Singh, Hon'ble Prime Minister of India and Her Excellency Christina Fernandez.

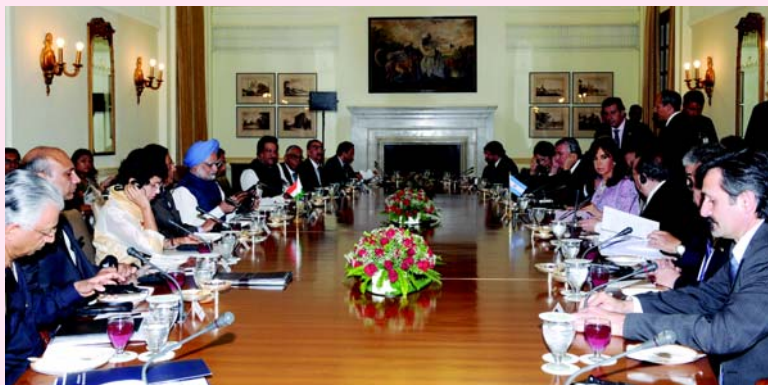


The Council of Scientific & Industrial Research (CSIR), New Delhi, signed an Institutional Cooperation Agreement with the National Council for Scientific & Technical Research (CONICET), Argentina, at a glittering ceremony organized by the Ministry of External Affairs (MEA) on 14 October 2009 at the Hyderabad House, New Delhi, during the State Visit of the Argentine President, Her Excellency Christina Fernandez.



Dr. (Ms) Marta Rovira, President, CONICET inked the Agreement on behalf of CONICET whilst Prof. Samir. K. Brahmachari, Director General, CSIR signed the Agreement on behalf of CSIR in the presence of Dr. Manmohan Singh, Hon'ble Prime Minister of India and Her Excellency Christina Fernandez.

The Agreement provides an umbrella mechanism for the exchange of scientists from the two countries and holding joint workshops in identified areas of mutual interest, which would lead to joint research projects with sharing of intellectual property rights. The potential areas of partnership identified for cooperation are: Energy, Pharmaceuticals, Biotechnology, Food and Nanotechnology.



Meeting of the delegates in progress

India Grants Access to U.S. Patent Examiners for New Traditional Knowledge Search Tool

In a landmark development, the Government of India has granted the patent examiners of the United States Patent and Trademark Office (USPTO) access to a new digital database containing a compilation of traditional Indian knowledge. Access to the Traditional Knowledge Digital Library (TKDL) is important for both India and the United States to prevent misappropriation of traditional knowledge. “The USPTO has long been concerned about attempts to patent traditional knowledge, not only because it may result in an incorrectly granted patent, but also because it removes knowledge from the public domain,” said Sharon Barner, Deputy Under Secretary of Commerce for Intellectual Property and Deputy Director of the USPTO.

This database will be an important addition to the growing array of search tools on traditional knowledge from around the world that is already available to USPTO examiners. These

tools include dictionaries, formularies, handbooks, and historical or classical works, as well as databases such as the TKDL. U S P T O examiners use these tools to help prevent the patenting, and thereby misappropriation, of existing traditional knowledge. A listing of some of these publicly

available traditional knowledge tools can be found on the USPTO’s website: <http://www.uspto.gov/web/offices/dcom/olia/tradknowledge.html>

“We have urged countries to



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

create, and make available to examiners around the world, digital libraries of their traditional knowledge to prevent erroneous patent grants,” Barner said. “India’s TKDL is just such

a library, and we are pleased that our examiners now have access to it.”

The new database, developed jointly by India’s Council of Scientific & Industrial Research (CSIR) and the Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homeopathy (AYUSH), includes over 200,000 traditional medicinal formulations on Ayurveda, Unani and Siddha comprising 30 million pages. The TKDL contains text-searchable English-language translations of these sources, permitting USPTO examiners to search thousands of years of India’s accumulated traditional knowledge. The TKDL also contains translations into French, German, Japanese and Spanish from these sources that were originally written in Hindi, Sanskrit, Arabic, Persian and Urdu.

The misappropriation of traditional knowledge through the mistaken issuance of patents has been a growing concern with the rise of the global economy and the increasing importance of intellectual property. A few high profile cases brought significant attention to this matter, prompting efforts by a number of countries to create digital traditional knowledge databases accessible to patent examiners around the world. If a patent application attempts to claim an invention within the existing traditional knowledge, a patent examiner will reject the application provided they can find evidence proving the prior existence of that knowledge. Searching the TKDL will provide access to just the sort of evidence needed by examiners to establish that proof.

R&D at NIO

Physiological Responses to Hypoxia and Anoxia in *Balanus amphitrite*

The barnacle, *Balanus amphitrite* is a dominant intertidal fouling organism. As its life cycle includes both sessile and pelagic phases, adaptation is a necessity to tolerate harsh conditions that are faced in the intertidal and pelagic environment in sea. The scientists of the National Institute of Oceanography (NIO), Goa, have recently observed a downward trend in dissolved oxygen levels in coastal areas which would have a more prominent effect on sessile organisms inhabiting the intertidal habitats.

The effects of reduced dissolved oxygen levels (hypoxia) and no oxygen (anoxia) on *B. amphitrite* adults and nauplii was assessed by NIO scientists. Their response was evaluated by estimating the levels of the antioxidant enzymes: catalase and superoxide dismutase. The impact of desiccation on antioxidant enzymes in adult *B. amphitrite* collected from different tidal heights was also evaluated. When nauplii were starved, 100% mortality was observed after 64 hr under hypoxia,

and between 24 and 32 hr under anoxia. However, when nauplii were exposed to hypoxia and anoxia along with food, their tolerance level increased. A decrease in naupliar feeding rate and oxygen consumption was observed when they were exposed to hypoxia and anoxia.

A significant difference in the levels of antioxidant enzymes in adult *B. amphitrite* collected at different tidal levels was observed. Enzyme activity increased with increase in the duration of tidal exposure, suggesting a capability to adapt to stress in different niches. Nauplii showed antioxidant defense (increased enzyme activity) under hypoxia and anoxia. The magnitude of change in enzyme levels suggests that these enzymes could be potential biomarkers of stress.

For more information read:

Desai, D.V.; Prakash, S.(2009). Physiological responses to hypoxia and anoxia in *Balanus amphitrite* (Cirripedia: Thoracica), *Mar. Ecol. Prog. Ser.*: **390**; 2009; 157-166.

Hydrographic and Productivity Characteristics along 45 E Longitude in the Southwestern Indian Ocean and Southern Ocean during Austral Summer 2004

The NIO researchers published their work carried out during the austral summer 2004 in *Mar. Ecol. Prog. Ser.* in 2009, when an intensive multidisciplinary survey was carried out in the Indian Ocean sector of the

Southern Ocean to study the main hydrographic features and the associated productivity processes. This sector includes circumpolar zones and fronts with distinct hydrographic and trophic regimes,



such as the Subtropical Zone (STZ), Subtropical Frontal Zone (STFZ), Subantarctic Zone (SAZ), Polar Frontal Zone (PFZ), North Subtropical Front (NSTF), Agulhas Retroflection Front (ARF), South Subtropical Front (SSTF), Subantarctic Front, Surface Polar Front (SPF), and Subsurface Polar Front.

Seasonal variations in the solar irradiance and day length, stratification, lack of micronutrients like iron and increased grazing pressure are the major factors that influenced or constrained biological production in this region. Even though broad differences in these controlling factors exist in time and space between the zonal regions, the upper 1000 m of the water column of the main zones, STZ, STFZ, SAZ, PFZ supported almost identical standing stocks of mesozooplankton, 0.43, 0.47, 0.45 and 0.49 ml m⁻³ respectively, during the austral summer.

This unexpected similarity can be explained either through the functioning of the microbial loop within STZ, STFZ and SAZ and the multivorous food web ecology within the PFZ. Dominance of ciliates in the microzooplankton community may be one factor resulting in the maintenance of a high mesozooplankton standing stock in SAZ. In contrast to the zones, frontal regions showed wide differences in hydrography and biological characteristics. The SSTF and SPF were far more biologically productive than NSTF and ARF.

For more information read:

Jasmine, P.; Muraleedharan, K.R.; Madhu, N.V.; AshaDevi, C.R.; Alagarsamy, R.; Achuthankutty, C.T;

Jayan, Z.; Sanjeevan, V.N.; Sahayak, S. (2009). Hydrographic and productivity characteristics along 45 degrees E longitude in the southwestern Indian Ocean and

Southern Ocean during austral summer 2004. *Mar. Ecol. Prog. Ser.*: 389; 2009; 97-116.

Oceanographic Research Benefits from Symbiotic Relationship with Fishermen

About 25% of India's population resides in the coastal zone. The activities of these people vary from traditional fishing to high-tech oil and gas exploration in the 2 million sq. km. of Indian EEZ. These communities, irrespective of their level of technology, would like to know 'how it is going to be out there when they are at sea'. Providing such information to this heterogeneous community demands the existence of a coastal environmental prediction system. Such a forecast system requires a mathematical model (or, more correctly, a modelling system) that mimics the actual conditions at sea on a day-to-day basis. As a pre-condition, such a model should first mimic the observed currents, waves, and so on.

At present, we do not have sufficient data to document the changes on time scales shorter than a few months (called intra-seasonal frequencies) along the Indian coast. Therefore, we do not have the means today to make predictions of 'the conditions at sea' on

a day-to-day basis. Building such a prediction system requires two things: a system for making relevant observations and the insight that generalizes these observations to yield theories that enable predictions.

With the objective of building science underlying a prediction system for the Indian coastal ocean, the National Institute of Oceanography's (NIO), Goa, under the Supra-Institutional Project (SIP) funded by CSIR is pursuing research work. This SIP project, 'Observing and Modelling the Interaction between Indian Ocean, Atmosphere and Coastal Seas (OMICS)' compliments another project, which makes long-term measurements along the Indian coast and is funded by the Indian National Centre for Ocean



Information Services (INCOIS), an institution under the Ministry of Earth Sciences (MoES). This programme funded by INCOIS is called “Enabling a Forecasting System for the Indian Seas: Observational Component (EnFoSIS-O)”.

These projects involve making observations in the seas around India, which are then simulated using numerical models. The objective is two fold: simulate the observations as accurately as possible with state-of-the-art general circulation models, and use a suite of models to decipher the dynamics that lead to the observed variability.

The Oceanographic Mooring Group at NIO works in tandem with the research scientists in deploying the subsurface moorings, recovering the data, and redeploying the instrumented moorings at sea to maintain continuity of collecting the time-series data. Presently, there are 14 locations along the Indian coast where these subsurface buoys have been deployed. On 16 September 2009, information was received at NIO via satellite that one of the subsurface Acoustic Doppler Current Profiler (ADCP) moored off

Mumbai coast may have surfaced from 100 m deep waters, but the exact location could not be determined. The Coast Guard was alerted and pictures of the moored ADCP buoy were faxed and emailed to them. The scientist-in-charge of the NIO regional centre at Mumbai was also informed, who soon alerted the fisheries department.

Based on previous experience of recovery of a similar mooring, newspaper advertisements were placed in the local Gujarati and Marathi dailies. Over the weekend and holidays that followed, an amazing number of calls were received from the fishing community and people who had spotted some floating objects in the sea off Gujarat. On 22 September, a call was received at the office of the NIO Director about an orange coloured 1m diameter buoy being located and this information was immediately passed on to the concerned scientists.

Telephone contact established the same night that the buoy in question was most likely the same one that had been lost. The caller, Mr Gohel Tulsi Keshav from Veraval, Gujarat, was responding to the newspaper advertisement, which

carried a photograph of the ADCP buoy, and his description left no doubt about the validity of his claim. Any lingering doubts were laid to rest when he mailed a photograph. Apparently, the ADCP buoy had got entangled in the fishing net of a trawler owned by Mr Gohel’s relative. An officer from NIO was deputed to go to Veraval and bring back the system containing the valuable data of nearly 11 months. This buoy had been deployed in the water on 21 October 2008, one day before the Chandrayaan launch. The scientists are now looking forward to analyzing the data recorded by this buoy.

Incidentally, in the past two years, this is the third time a coastal ADCP buoy has been entangled in the fishing nets. The earlier two occasions were off Malpe, Karnataka and off Kollam in Kerala and on those occasions too, NIO researchers were successful in recovering the buoy with data intact. They have found the fishermen to be cooperative in all their interactions with them as they too realize that they are the beneficiaries of the research that is being done by NIO and INCOIS.

Open Source Drug Discovery (OSDD) Programme Completes One Year

The CSIR-led Innovative Open Source Drug Discovery (OSDD), Programme was launched by Shri Kapil Sibal, the then Minister for Science & Technology and Earth Sciences on 15 September 2008 (*CSIR News* 58 (21) 2008, p.325). This CSIR-led consortium, launched to combat the scourge of infectious diseases that afflict the developing world, has just completed a year. OSDD has crossed 2000 registered users and at present it stands at 2011. The pace of increase in the number of registered users reflects the confidence this initiative has generated. With Prof. Samir K. Brahmachari, Director General, CSIR, as OSDD’s Chief Coordinator and Mentor, the community has several credits to be proud of including open peer review, open funding review, large number of real time data on open lab notebook. The next big leap planned is to completely re-annotate the *Mycobacterium tuberculosis* (MTb) genome for which OSDD has launched ‘Connect to Decode’ 2010 (c2d.osdd.net). At present there are about 450 participants.



High Speed Airbreathing Propulsion Gains Momentum

High Mach number airbreathing propulsion is an area of research & development vital to India's strategic needs. Propulsion is the most important pacing technology for the high speeds at which advanced aerospace vehicles such as, Access-to-Space Vehicles, Trans-atmospheric Vehicles and Missiles fly. From performance considerations, high-speed aerospace vehicles that fly at Mach numbers greater than 3 (speeds greater than three times the speed of sound) need to necessarily employ advanced airbreathing propulsion systems such as, ramjets, supersonic combustion ramjets (scramjets) and their complex derivatives of ramjet/scramjet. Such critical engine technologies are closely guarded abroad.

The National Aerospace Laboratories (NAL), Bangalore, have active R&D programmes for the development of advanced high-speed combustors for the High Speed Flight Technology Demonstrators of the Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram and the Defence Research and Development Laboratory (DRDL), Hyderabad. To carry out the appropriate full-scale ground tests, a High-Speed Combustor Test Facility has been set-up at the Propulsion Division, CSIR-NAL, Nilakantan Wind Tunnel Centre, Bangalore, with joint funding from ISRO, DRDO and CSIR. This versatile test facility was inaugurated recently by Dr. G. Madhavan Nair, Chairman, ISRO and Chairman, Research Council, NAL.

Dr. Madhavan Nair, in his address, complimented NAL for setting up such a complex test facility, which will allow the indigenous development of critical advanced subsonic/supersonic combustor technologies for India's futuristic high Mach number propulsion systems. He stressed that a comprehensive design database should be quickly built up by carrying out extensive testing which is now possible in India.

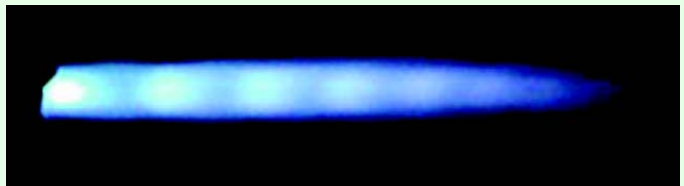
Dr. A. R. Upadhyya, Director, NAL, in his opening remarks informed that 'Supersonic Combustion' has been a thrust area activity of NAL and as it was in the early nineties that this activity was initiated in NAL jointly with DRDL by the then DRDL Director, Dr Abdul Kalam and the then NAL Director, Professor Roddam Narasimha. The new test facility could be today employed to carry out full-scale after burner developmental tests for the aero-engine gas turbines being developed by the Gas Turbine Research Establishment (GTRE), Bangalore, which has already funded a related programme.



High-Speed Combustor Test Facility – Supersonic Combustion Leg



Dr. Madhavan Nair initiating the inaugural test run of the Facility



Typical kerosene/hydrogen supersonic flame showing the shock diamonds

Geothermal Climate Change Observatory Established at NGRI (Choutuppal Campus)

A Geothermal Climate Change Observatory was established at Choutuppal campus of the National Geophysical Research Institute (NGRI), Hyderabad, with the support of the Department of Science and Technology, Government of India. The observatory, which comprises an automatic



Inauguration of Climate Change Observatory by NGRI, Director, Dr. V. P. Dimri

weather station located next to a set of boreholes going down to 210 metres, will allow scientists to study how meteorologic variables affect ground temperature and eventually the deep rock temperature.

Inaugurating the observatory, Dr V. P. Dimri, Director, NGRI, said that the datasets being acquired at the observatory would be invaluable for studies on global climate change and its signature in the solid Earth. This is the first Geothermal Climate Change Observatory of its kind in the low latitude belt (0-30°N), and would allow comparisons with a similar observatory set up in Utah, USA in the higher latitudes.

The observatory is located at Choutuppal area far away from potential urban heat island effects. The weather station samples the surface air temperature, humidity, precipitation, solar radiation, wind

speed and direction at two second intervals and stores the information once every 15 minutes. The diurnal and annual variations of the surface air temperature decay by about 50 centimetres and 15 metres of depth respectively. The long term (order 10-100 years) changes in surface air temperature, owing to climate change, diffuse further down in the

Earth and perturb the natural temperature distribution up to depths of 100-200 metres. Therefore, by measuring the temperature in a borehole today, scientists will be able to infer both the magnitude and the onset time of warming (or cooling) that took place during the last 300 years, much before the start of

the extensive meteorological records in India. Furthermore, by measuring changes to the Earth's temperature profile over time, scientists would be able to quantify the nature and extent of tracking between ground temperature changes and surface air temperature changes recorded at the co-located weather station.



Layout of the Observatory showing automated weather station and two boreholes



CMS-based Website launched at NGRI



Recently a new CMS-based website was launched at the National Geophysical Research Institute (NGRI), Hyderabad, by Dr V. P. Dimri, Director, NGRI. The credit for the successful design and launch of this NGRI website goes to Dr Ajay Manglik, Chairman, Website Committee, NGRI and Head, IT Group, Shri G. Rama Seshagiri.

Content Management System (CMS) is a computer application used to collaboratively create, edit, review, index, search, and publish digital content. Customized templates can be used to ensure standardized look and feel throughout the site.

CMS is web-based application and workflow is built into the system. Users can be created, managed and access controls can be set on the system. A 'WYSIWYG' (What You See IS What You Get) editor with Browser-based Interface is available to the users and those familiar with simple Word processing can create/modify the webpages directly without any knowledge of HTML.

Studies on Polymer Degradation in Solution

Shanti Swarup Bhatnagar Prize-winner:
Dr Giridhar Madras

Dr Giridhar Madras of Department of Chemical Engineering, Indian Institute of Science (IISc), Bangalore, has been awarded along with Dr Jayant Ramaswamy Haritsa of IISc, Bangalore, Shanti Swarup Bhatnagar Prize for 2009 in the discipline Engineering Sciences' for his contributions to the field of Polymer Degradation in Solution. [*CSIR News*, 59 (2009), 303].



The study of thermolytic degradation of polymers is of considerable importance both from practical and theoretical standpoints. Among the various applications, degradation has been extensively used to recycle waste plastics and convert plastics into useful end products. Degradation of plastics, in solution, is a new process. The focus of Dr Giridhar Madras's work was on studying the kinetics and degradation rate of various polymers in solution. Due to high heat transfer rates, the degradation temperature is much lower than the degradation temperature of the polymer in pyrolysis. This process is of considerable interest since the group led by Dr Madras was able to convert plastic waste to useful end products like fuel oil. They have also extended their investigations to the degradation of polymers in supercritical fluids.

In this context, they have developed continuous distribution kinetic models to determine the rate parameters and the activation energies for polymer degradation from the time evolution of the molecular weight distributions. Dr Madras's team has investigated the use of ultrasound, acids, microwaves and UV light as a means for polymerization and degradation. Based on the current studies, it has been determined that the rates are considerably enhanced by the use of these non-conventional techniques.

Honoured with Shanti Swarup Bhatnagar Prize, Dr Madras has been able to solve several fundamental issues regarding polymer degradation in solution that were unresolved previously. His team was the first in the world to investigate the degradation of polymers in supercritical fluids and prove that the degradation rate coefficients of polymers in the supercritical condition are significantly higher than that in the subcritical condition. However, the activation energies for the degradation are the same in both supercritical and subcritical solvents but the Arrhenius prefactors are different. His team has shown that this is due to the clustering of the polymer with the solvent at the



supercritical conditions resulting in a different controlling mechanism.

The award-winning work comprises the development of a new titania catalyst based on solution combustion technique, which has been shown to be superior as compared to the commercial catalysts for the degradation of polymers. The higher photocatalytic activity of this catalyst has been attributed to the reduced band gap, higher hydroxyl content and higher surface area of this catalyst compared to the commercial catalyst. The team has elucidated the mechanism of polymer breakage based on concerted re-arrangement (Photo-Fries) and non-concerted cage recombination. The use of other catalysts for the thermal degradation of polymers has also been demonstrated.

The degradation of polymers in the presence of ultrasound has been extensively studied for decades by various researchers. Based on the time evolution of the complete molecular weight distribution, the first to prove that the breakage of the polymer occurs around the midpoint with a distribution rather than an ideal mid-point scission. Further, the degradation rate coefficient was proved by the Indian scientists to be independent of the initial molecular weight in contrast to that proposed by other researchers.

The team of Indian scientists led by Dr Madras has shown that the enzymatic degradation of polymers in solution occurs by specific chain-end scission and is greatly influenced by the viscosity and polarity of the solvent. They have

Biographical Sketch

Giridhar Madras received his Chemical Engineering Degree from the Indian Institute of Technology at Madras in 1990. He subsequently obtained his PhD degree in Chemical Engineering from Texas A&M University, USA, in 1994. He then worked in the University of California at Davis, USA. He returned to India as an Assistant Professor of chemical engineering at the Indian Institute of Science, Bangalore, in 1998. Since 2007, he has been a Professor at the Chemical Engineering Department, and is currently the Chairman of the National Center of Scientific Information. He received the Scopus Young Scientist Award from Elsevier for being the most cited young author in engineering. He was awarded the Presidential Swarnajayanthi Fellowship by the Department of Science and Technology, India, in 2006 and the S. S. Bhatnagar Prize from CSIR, India, in 2009 for his contributions to the field of engineering. He has published more than 225 international journal articles, which have more than 2500 citations with high index of 27. He is listed by Web of Science as among the top 1% of all scientists in the world based on citations. He is currently a member of the Editorial Board of several journals including *Current Science* and *International Journal of Polymer Science*. His research interests are in the areas of polymers, supercritical fluids, catalysis and reaction engineering.

shown the lipase specificity for the hydrolysis and degradation of polymers and determined the fundamental rate coefficients for these processes.

This novel research has led to the development of techniques for the degradation of polymers under microwave radiation. Because the temperature in a microwave varies with reaction time, the Indian scientists have developed a complex population balance equation method to determine the rate coefficients and proved that degradation occurs not because of temperature but due to enhanced transport properties and the flash heating that occurs in microwaves.

Contrary to conventional wisdom, Dr Madras's group has shown, for the first time, that even if two polymers in a blend or mixture

or as a copolymer may show enhanced mechanical strength, it may show lower stability towards thermal degradation in solution.

Combo processes, arising from a combination of two discrete processes, such as combined ultrasonic and ultraviolet exposure, provide a new technique to degrade polymers. The experimental set-up is challenging and the modeling of these phenomena is also challenging because this is a combination of different chain scissions that occur simultaneously. This combo process has shown that an increase in overall rate of degradation on the combined simultaneous exposure of ultraviolet and ultrasound is due to the increase in number of scission products per breakage and not due to the increase in the intrinsic rate.



Studies on Database Engines

Shanti Swarup Bhatnagar Prize-winner: Jayant R. Haritsa

Dr Jayant Ramaswamy Haritsa of Supercomputer Education & Research Centre, Department of Computer Science & Automation, Indian Institute of Science (IISc), Bangalore, has been awarded along with Dr Giridhar Madras of IISc, Bangalore, Shanti Swarup Bhatnagar Prize for 2009 in the discipline 'Engineering Sciences' for his contributions to the field of Database Engines. [CSIR News, 59 (2009), 303].

Over the past two decades, Prof. Jayant Haritsa has carried out research on the theory, architecture, algorithms and data structures of database engines, which form the core of enterprise information systems. His efforts have spanned both transaction-processing and decision-support environments, the two main streams of database research activity. He has made ground-breaking advances in areas such as real-time databases, data mining, semi-structured databases, multi-lingual databases, biological databases and query optimization, for which he has been credited with Shanti Swarup Bhatnagar Prize.

a) Real-time Database

A real-time database system is designed to handle workloads where transactions have completion deadlines. Prof Haritsa has developed a rich suite of schedulers for real-time transactions in both centralized and distributed settings. His discovery that optimistic concurrency control is the key to simultaneously enforcing data

integrity constraints and transaction timing constraints, has sparked off a large body of subsequent research. He has also created mathematical frameworks for characterizing real-time performance in steady-state and overload conditions, and developed architectures that successfully integrate the conflicting requirements of security and performance objectives.

b) Data Mining

The goal of data mining is to extract strategic statistical models from mountains of raw data. Prof. Haritsa has pioneered the development of high-performance algorithms for mining column-organized databases, resulting in substantial improvements over the *prior art* based on row storage. He also introduced the problem of preserving privacy of user data in association-rule data mining, and developed a matric-theoretic randomization technique that simultaneously provides privacy of user data and accuracy of mining models. A recent fundamental breakthrough was the development of a generalized privacy-preserving framework, and employing this framework to construct a provably optimal data randomization matrix.

c) Semi-structured Databases

The semi-structured language, XML has become the defacto standard for information exchange and storage on the Internet. However, its effectiveness is hampered by its extreme verbosity. Prof. Haritsa elegantly solved this

problem by developing a new compression technology, called homomorphic compression, that directly and efficiently supports queries in the compressed domain, thereby making XML accessible even to resource-limited devices. This work has been widely cited and has generated considerable follow-up research. In collaboration with an American research group, he also built the first system to take a cost-based and statistically consistent approach to XML storage on relational database engines, ensuring that appropriate mappings are chosen for each application.

d) Multilingual Databases

Efficient storage and query processing of data spanning multiple natural languages is of crucial importance in today's globalized world, Prof. Haritsa has identified and quantitatively characterized the "language-divide" in terms of preferential database performance and functionality for data in Latin-script-based languages such as English. This work has initiated a new field of database research activity, and is especially relevant in the Indian context due to the many scripts used in the country. Further, he has designed new database architectures and query operators for bridging the language-divide, facilitating e-governance





applications to be seamlessly used in vernacular languages.

e) Biological Databases

The indexing technique commonly used in genome studies is the suffix tree, which is based on a vertical compaction of the underlying trie structure. Prof. Haritsa has proposed a radically different indexing technique, based on a novel horizontal compaction of the trie that remarkably results in a complete collapse into a linear structure. This index provides substantial search-time performance improvements over the current access methods while the linearity of its structure makes it ideally suitable for integration with database engines. It also has the desirable property, not shared by any other index, of being prefix-partitionable.

f) Query Optimization

Automatically optimizing declarative database queries is a computationally intensive process since a combinatorially large set of alternatives have to be considered and evaluated. Prof. Haritsa has brought a unique machine-learning-based perspective to bear on this classical problem, resulting in a technique called 'query clustering' that provides order-of-magnitude reductions in optimization time. This work is one of a select few research publications to be featured on SQL Summit, a highly-regarded database industry portal.

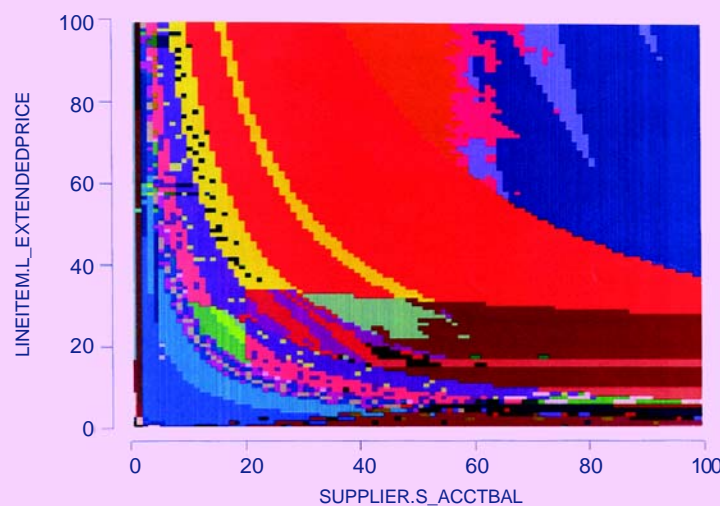
In recent years, Prof. Haritsa has developed 'Picasso', a powerful visualization software for the systematic investigation and redesign of database query optimizers. Picasso has attracted

Biographical Sketch

Dr. Jayant Haritsa is a Professor in the Supercomputer Education & Research Centre and in the Department of Computer Science & Automation at the Indian Institute of Science, Bangalore, which he joined in 1992. He received the B.Tech. degree in Electronics and Communications Engineering from the Indian Institute of Technology (Madras) in 1985, and the MS and PhD degrees in Computer Science from the University of Wisconsin (Madison) in 1987 and 1991, respectively. He has held visiting positions at the University of Maryland (College Park) and Lucent Bell Labs. He is a Fellow of the National Academy of Sciences, India (NASI); a Fellow of the Indian Academy of Engineering (INAE), and a Distinguished Scientist of the Association of Computing Machinery (ACM). He is on the Editorial Board of *IEEE Transactions on Knowledge and Data Engineering*, *Very Large Data Bases Journal*, *Journal of Distributed and Parallel Databases* and *Journal of Real-time Systems*. He is a recipient of Hari Om Ashram Prerit Dr. Vikram Sarabhai Research Award, Swaranjayanti Fellowship and Sir C V Raman Young Scientist Award.

widespread interest by bringing to the fore a variety of fundamental design limitations in modern optimizers. IISc has obtained a copyright on the software from the Government of India, and licensed it to a host of database companies and academic labs worldwide. In a compelling example of its utility,

Prof. Haritsa's group has successfully employed Picasso to identify query execution strategies that are robust to selectivity estimation errors, a chronic problem plaguing database engines for over four decades. A sample picture of a Picasso diagram is shown below.



The picture shows a "plan diagram" produced on a modern query optimizer by the Picasso software tool. Each color represents the optimality region of a particular strategy (or plan) over the parameter space.



Workshop on Herbarium Techniques

The National Institute of Science Communication And Information Resources (NISCAIR), New Delhi conducted a six-day workshop on Herbarium Techniques during 16-21 November 2009. The workshop was organized with an aim to impart current knowledge on scientific methods of plant collection, preservation, identification, nomenclature, techniques for creation of herbarium database, documentation of information on plants, management of herbaria etc. to the participants and to make them aware of the latest developments related to the herbarium methodologies.

The workshop was targeted to benefit herbarium curators, college/university lecturers, bioscience teachers of schools, scientists from research institutions, research scholars and students and those who were interested in setting up a regional herbaria to house plants of their locality for education and research purposes. The workshop was attended by 22 participants, three from SAARC member countries, Pakistan, Afghanistan and India and 19 from different parts of India.

The contents of the workshop were divided into four modules. Module one was on Herbarium Techniques comprising: (i) Functions of the herbarium (ii) Methods of plant collection and documentation of information, and (iii) Practical exercise including field trip for collection of plant specimens. Module two was on Creation of

Herbarium Database and Processing of Mycological Specimens. Module three was on Techniques of Plant Identification and Nomenclature, and Module four was on the Role of Herbaria in Research, Education and Conservation of Biodiversity and Protection of Environment and Management of Herbaria.

Welcoming the participants, Dr. Gangan Prathap, Director, NISCAIR, appreciated the initiatives taken by the Raw Materials Herbarium & Museum Division (RHMD) in organizing the workshop on Herbarium Techniques, and said that India has a long tradition in collecting, identifying and documenting information on plants used for curing various ailments, even before Linnaeus, the Father of Taxonomy. He quoted an example of the book, '*Hortus Malabaricus*' which was written by Hendrik van Rheedee during 1678-1703, even before Linnaeus was born in 1707. The book comprises 12 volumes having about 500 pages each, with 794 copper plate engravings. The book was written in Malayalam and thence translated into Portuguese, and further translated into Latin. It is believed to be the earliest comprehensive printed work on the flora of Asia and the tropics.

Inaugurating the workshop, Dr H. B. Singh, Head RHMD and Convener of the workshop, briefed the participants about the scope of the workshop. He opined that herbarium constitutes the most

essential working tool for study of any branch of botany, particularly plant taxonomy. Creation of herbarium needs a thorough knowledge on plant identification, current nomenclature, processing of plant specimens, their preservation, and use of computers in creating herbarium databases for rapid retrieval of information. He said that these aspects would be covered during the course of the workshop.

In the first technical session, Dr B. Subramaniam, Scientist, NISCAIR, gave a presentation on "*Herbarium and its Functions*". He mentioned that herbaria are the essential scientific tools for establishing correct botanical identity and nomenclature of plants, and housing plant specimens according to a recognized system of classification.

He opined that herbarium apart from being a basic resource for the study of systematic botany and related fields, also serves as a reference center, a documentation facility and data storehouse. Additionally, herbarium specimens are also frequently used as an aid in teaching and research, conservation of biodiversity and protection of environment, in confirming the genuineness of the plant raw material samples used in the Indian system of medicines. Phenological data on herbarium sheets are also used to understand the effect of climate change, study of phytogeography, change of vegetation over a period of time, phytochemistry, extraction of DNA molecules for



phylogenetic studies, and so on.

Dr. H. B. Singh explained about the materials and equipments required during the collection of plant specimens and for developing a new herbarium. He also discussed the methods of collection of different groups of plants from different habitats. The participants were apprised about the information that could be documented in the field record notebook, particularly the characters which may be lost after drying of the specimens.

Keeping in view the Convention of the Biological Diversity (CBD), participants were told that collections should be environment friendly, and the plants required

should be collected in such a way that the associated plants are not destroyed. The thumb rule of 1: 20 should be followed during collection of plant specimens. It should be ensured that an adequate population of the species, to be collected in the field, should exist and in no case the rare and endangered plants are collected, instead photographs may be taken. Dr Singh also demonstrated correct techniques used in pressing of collected plant specimens.

A field trip for collection of plant specimens was organized in and around Buddha Jayanti Park area of New Delhi Ridge. A hands-on exercise for processing of specimens like

mounting, stitching and labeling was given to the participants to make them conversant with the processing techniques, used in preparing herbarium specimens.

Mr. C. B. Singh, Scientist, NISCAIR, made the participants aware of the methods of creating herbarium database. He threw light on the different software required for creating herbarium database.

Dr. D. K. Agarwal, ex-Head, Mycology Herbarium, IARI, New Delhi, enlightened the participants on collection and preservation of various groups of fungi and diseased plant specimens followed by a visit to the Herbarium. '*Cryptogamae Indiae Orientalis (H.C.I.O.)*' which



CSIR Foundation Day Celebrations

was established in 1905 at Indian Agricultural Research Institute (IARI), New Delhi.

Dr M. P. Sharma, Professor of Botany, Jamia Hamdard, New Delhi, gave an elaborative talk on 'Plant Nomenclature'. He elaborated the rules and regulations of the International Code of Botanical Nomenclature (ICBN) by which name of a taxon is established.

Dr. B. Subramaniam delivered a lecture on *Plant Identification*. He demonstrated online databases related to plant identification using vegetative characters of the plants. A hand-on exercise on plant identification was also conducted by him, where each participant was given ten plants and asked to prepare a key on the basis of vegetative characters of leaves and identify them with the help of the software provided to the participants.

Dr H. B. Singh discussed the methods of plant preservation. He elaborated on different methods which are used for preservation and protection of plant specimens in the herbarium.

Dr P. L. Uniyal, Reader, Department of Botany, Delhi University, gave a talk on the 'Role of Herbaria in Conservation of Biodiversity and Protection of Environment'. He opined that herbarium is a centre of database that can be used for deciding primary centre of origin of genetic resources. He further elaborated importance of herbaria to serve as a means of locating hotspots, endemism, rare or possibly extinct species via recollecting areas listed

on label data. In his opinion, herbarium is the gold mine of information as it provides authentic material for study in taxonomy, ecology, anatomy, morphology, conservation biology, biodiversity, ethnobotany, and paleobiology and also helpful for the planners and decision makers. He pointed out that herbarium could be used to detect evolutionary changes in the time and space by DNA extraction and fingerprinting methods.

Dr Uniyal's lecture was followed by a visit to the "Yamuna Biodiversity Park" Delhi. Dr Ekta Khurana, Scientist of the Yamuna Biodiversity Park, said that the park is a joint venture project of the Delhi Development Authority (DDA) and the Center for Environmental Management of Degraded Ecosystems (CEMDE), Delhi University. The park acts as a heritage site and repository of approximately 50 threatened communities of Yamuna river basin. Dr. A. K. Singh, the scientist looking after the Biodiversity Park explained about the techniques being used by them for successful regeneration of different kinds of plants brought to the Park from diverse habitats.

Prof. K. S. Rao, Botany Department, University of Delhi, delivered a lecture on 'Biodiversity Characterization Using Remote Sensing and GIS'. He told that around 127,000 species of plants, animals and microorganisms have so far been reported from India and 400,000 species are yet to be explored. Dr. Rao explained the remote sensing in details and said

that RS means sensing of earth's surface from space by making use of the properties of electro-magnetic waves emitted, reflected or diffracted by the sensed objects, for the purpose of improving natural resource management, land-use, bio-diversity characterization and protection of environment.

Prof. A.K. Pandey, Botany Department, Delhi University delivered a lecture on 'Use of Herbaria in Establishing Phylogeny Through Molecular Biology Approaches'. He emphasized the need of molecular study of a species because the traditional taxonomic practices are insufficient on their own to cope with the growing need to accurate and accessible taxonomic information. He was of the opinion that DNA analysis provide a new scaffold for the accumulation of taxonomic knowledge; a convenient tool for species identification and description; and provide a chance to overhaul the current plant classification system. He pointed out that DNA bar coding is a novel system for species identification by using short DNA sequences.

The technical lecture session concluded with a lecture by Dr. H. B. Singh on, 'Management of Herbaria'. He pointed out that proper management of herbarium is essential for proper utilization of men and material resources for fulfilling the needs of the herbarium users in an effective manner. He explained how to protect the herbarium collections deposited in herbaria as well as during the transit of herbarium specimens on loan



from one herbarium to another herbarium within the country or among the countries on global level.

At the valedictory function, participants expressed their views that the workshop was very informative, well planned and rich in content. Some of the participants were of the view that more practical sessions for processing of herbarium specimens should have been added. Dr Gangan Prathap gave the certificates and CDs on Herbarium Techniques prepared by RHMD for UGC and copy of the lectures delivered during the workshop to the participants.

Dr Gangan Prathap, assured the participants that some of the suggestions proposed by them would be considered in future programmes. He thanked the faculty members for their contributions and the participants for attending the workshop.

The workshop ended with a Vote of Thanks, proposed by Dr H. B. Singh.

CSIR Foundation Day Celebrations at CSIO, IICB, IMMT and NCL

CSIR News has already covered the CSIR Foundation Day Celebrations at several labs in the earlier issues (Vol. 59 No. 21 & 22 pp. 308-314). Highlighted here are the celebrations at CSIO, IICB, IMMT, and NCL:

Central Scientific Instruments Organisation (CSIO), Chandigarh

At CSIO, Prof. V.S. Ramamurthy, Former Secretary, DST and Chairman, Recruitment & Assessment Board, CSIR, New Delhi, delivered the Foundation Day Lecture on *The Challenges of Building the Human Resource Pipeline in Research intensive Organizations* on 26 September 2009.

He said that generation, dissemination and storage of knowledge requires human efforts. Thus, in the research institutes, like other resources, human resources are very critical. Even the management of knowledge generating human resource is a unique task in itself.

In the changed scenario of instant success and instant money, attracting bright young students into research career has become very difficult. The number of career options have also increased manifold over the years, making the students less inclined towards research. He stressed upon the need of making the long recruitment procedures simple and de-bureaucratization of research organizations. He opined that retired people can be a vital Human Resource by executing the role of mentors. Hiring them for training and consultancy purposes will also prove very cost-effective.

Earlier, Dr Pawan Kapur, Director, CSIO while welcoming the Chief Guest highlighted the aims and goals of CSIR and its contribution in the field of science and

technology. He talked about various incentives and awards schemes of CSIR for young scientists and school children. Dr Kapur also presented an overview of the on-going projects and future plans of the organization.

All those staff members of CSIO, who had completed 25 years of regular service in CSIR and who retired during the period from September 2008 to August 2009 were also honoured by presenting them mementoes and shawls.

The programme concluded with the prize distribution to the winners of various competitions held earlier as a part of CSIR Foundation Day. An Essay Writing Competition for the wards of CSIO staff in two categories, a speech and poem and story telling competition was organized on 22 September 2009 as a part of CSIR Foundation Day celebrations. Shri M.R. Masan, Controller of Administration proposed the Vote of Thanks.

As a part of CSIR Foundation Day celebrations, CSIO Labs were kept open for general public on 25 September 2009. More than 600 visitors, including students from various schools, engineering colleges, university, and general public went around various laboratories of the organization. This provided them a unique opportunity to see the live demonstration of the instruments developed at CSIO and a chance to interact with the scientists.



CSIR Foundation Day Celebrations

Indian Institute of Chemical Biology (IICB), Kolkata

IICB, celebrated the 67th Foundation Day of CSIR on 8 October 2009. Prof. Siddhartha Roy, Director, IICB presided over the function in which Prof. Pradip Narayan Ghosh, Vice-Chancellor, Jadavpur University, Kolkata was the Chief Guest. Prof. V. Nagaraja, Chairman, Department of Microbiology and Cell Biology, Indian Institute of Science (IISc), Bangalore, delivered the Foundation Day lecture entitled *'Mechanistic and Functional Insights into Various Cellular DNA Transaction Process'*.

In his Welcome Address, Prof. Roy mentioned about the foundation stone laying ceremony for the new campus of IICB at Salt Lake, Kolkata and announced that the campus will be ready alongwith its new facilities within one and a half year as promised. He also cited the recent visit of Dr. Kasturirangan, the former Director of ISRO and an incumbent member of the former Planning Commission of India who had mentioned IICB as the "Gem of an Institute".

Prof. Ghosh, in his address, said that CSIR activities were started well before independence when people realized that India needs to go ahead with industry, needs rejuvenation of existing industries,

needs setting up of new industries and so on. It was probably established following the pattern of DSIR in England. Though initially it was set up for industry, later it was felt that basic science should not be neglected and therefore, CSIR labs also emphasized on basic sciences. Citing the example of Dr. V. Ramakrishnan he expressed that science has no barrier, good science requires good efforts only. He felt that the Government has to improve the status of industrial research in our country and there should be more stress on Engineering and Technology Research. In this regard he also mentioned a recent article by Dr. Gangan Prathap, Director NISCAIR and Dr. B.M. Gupta of NISTADS, CSIR, published in *'Current Science'*, August 2009 issue. Prof. Ghosh said that the Universities and Engineering & Technological Institutes require



CSIR Foundation Day Celebration at IICB. Seated on dais (from left) are: Dr. H. K. Majumder, Prof. V. Nagaraja, Prof. S. Roy, Prof. P. N. Ghosh and Dr. S. R. Sarkar

more initiative towards developing their research infrastructures and the government should pay proper attention to increase research activities in Engineering & Technology.

The employees of IICB who had completed 25 years of council service and the employees who had retired from their services in IICB during September 2008 and August 2009 were honoured by presenting mementos. The Institute also observed 'Open House' on 28th October, 2009 to enable people to visit the laboratory. A large number of students from about 15 schools and colleges with their teachers visited various laboratories and interacted with the scientists.

Institute of Minerals and Materials Technology (IMMT), Bhubaneswar

At IMMT, Dr. Rabi Bastia, Sr. Vice President (Exploration Operations), Reliance Industries Ltd, Navi Mumbai, who was the Chief Guest, delivered the Foundation Day

Lecture entitled, *'Building Energy for India Tomorrow: Innovation and Technology can Transform'*.

On this occasion, mementoes were presented to the IMMT staff

members who had retired during 2008-09 and those who had completed 25 years of service with CSIR. Awards were given to the meritorious children of CSIR



employees and the winners of the Essay Competitions organized as a part of celebrations. Three students were awarded CSIR Studentship for getting admission in IIT and securing high percentage of marks in science subjects. Class toppers of the RRL Project U.P. School,

situated in IMMT premises were also given prizes.

The Chief Guest also released the second volume of IMMT's Hindi Bulletin '*Abhibyakti*' and the Odia translation '*Paramanu O Pragati*' done by IMMT scientists Dr. R.K. Paramguru and Dr. A Parida from

the English version of the book, '*Atoms & Development*' published by HBCSE, Mumbai. Prof. B.K. Mishra, Director, IMMT, presided over the function. Dr. Rajeev, Scientist-G coordinated the event and proposed the Vote of Thanks.

National Chemical Laboratory (NCL), Pune

At NCL, Prof. Roddam Narsimha, FRS, Chairman, Engineering Mechanics Unit, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, delivered the CSIR Foundation Day Lecture titled, '*The Greatest Puzzle of Classical Physics: The continuing challenge of turbulent flows*' on 25 September, 2009.

Prof. Narsimha enlightened the audience on topics of fluid flows, turbulence and clouds. He brought out the childhood feelings in the audience by reminding them of how water, flowing say in a rivulet, shows the most exquisite arrangements of curved flow lines that perpetually change shapes and present perhaps the most beautiful series of inorganic patterns that nature can possibly produce. He also reminded the audience of how clouds have played a central role in art and poetry in ancient India. He illuminated the audience on the reasons behind the various formations of cumulus clouds owing to turbulence triggered by temperature gradients.

Prof. Narsimha's lecture created immense interest in understanding fluid flows that exhibit extraordinary diversity. He emphasized the point that the early day notion about



Prof. Roddam Narsimha delivering the talk

determinism of systems that follow Newton's laws of motions was shattered post 1960, largely due to increasing understanding of turbulent flows. Interestingly, modern day research in fluid mechanics has porous borders encompassing physics, mathematics and engineering, the fluid dynamists of the 19th century were divided into hydraulic engineers and mathematicians who rarely talked to each other, rather were full of contempt for each other! He briefed the audience about the earlier works on fluid dynamics of pioneers such as Ludwig Prandtl, Garret Birkoff and Reynolds. Prandtl, the founder of modern fluid dynamics whose lack of mathematical training did not deter his development of new

mathematics of boundary layer flows, wrote simple limiting equations for fast flows and used for the first time a hybrid approach involving observations, numerical experimentation, analysis and computation to solve difficult problems in hydrodynamics.

Prof. Narsimha also described Birkhoff's work on hydrodynamics namely, "A study in Logic, Fact and Similitude", which listed nearly 20 apparent paradoxes in hydrodynamics. Birkhoff's diagnosis amounted to a list of several fallible hypotheses which were often used in hydrodynamics. These included, for example, that intuition suffices for determining which physical variables require consideration, that small causes produce small effects, and infinitesimal causes produce infinitesimal effects, that symmetric causes produce effects with the same symmetry, and that the flow topology can be guessed by intuition.

Prof. Narasimha then introduced the very important dimensionless number in fluid mechanics namely, the Reynolds number, named after Osborne Reynolds who carried out some of the most intriguing flow visualization



CSIR Foundation Day Celebrations

experiments in fluid flow in 1883. He showed the wide range of Reynolds numbers that are pertinent to several commonly observed flying objects such as a fly, birds, model airplanes, human powered aircrafts, large aircrafts and air ships. He stated Reynold's flow visualization experiment and showed beautiful pictures of eddies that are shed in simple flows such as that past a cylinder. Such flow visualization experiments are today used to study turbulent jets and formation of large clouds.

Prof. Narsimha, in his lecture, described the nature of cumulus cloud which he called as the queen of the tropical sky. He shared his observation on different forms of clouds and beautifully reasoned out their existence in the particular form. In ancient times it was believed that different formations of the clouds predicated a particular incident. Through his analysis and experimental results he proved that shapes of certain cumulus clouds can be the result of heat generated by the atmosphere at a given time. Prof. Narsimha explained how his research of preparing an artificial cloud led him to discover the peak and height of certain clouds that appeared to be higher than the others. He called the tip of the clouds as plume and exemplified them through pictures and graphs. He compared the real clouds with that of the artificial ones prepared by him in the lab. Prof. Narsimha had taken cross-sections of the artificial cloud plume and researched on its intensity to form the largest plume based on condensation and heat. He stated

that heating disrupts order and that the ability to grow disappears. Newer clouds are formed and older clouds disappear.

Prof. Narsimha concluded by saying that fluid flow can exhibit extraordinary diversity. While modern day fluid dynamics is a creature of the 20th century, and that laminar flows are largely understood and can be computed based on this knowledge, the same cannot be said of turbulent flows of which much is known but little is understood. He said that instability, chaos and order are key ingredients of tougher problems in turbulence. While computation offers new tools to solve turbulent flow problems and even for theory, the central problem of high Reynold turbulence lies beyond the most powerful theories, computers and experimental techniques. Therefore, the time has perhaps come for Newtonian fluid mechanics to have a new mathematics.

Earlier, Dr. S. Sivaram, Director, NCL, welcomed the audience and gave a brief on CSIR as a whole and the purpose of celebrating CSIR's Foundation Day. He said that CSIR was built with a purpose and a mission that has evolved over a period of time. The challenges that science and technology bring about is the important reason for the existence of CSIR. Dr. Sivaram said that NCL since 2002, continues to celebrate CSIR Foundation Day by inviting those distinguished leaders who have made significant contributions to CSIR. He then introduced Prof. Narsimha to the audience. Dr. Sivaram described Prof. Narsimha

as a distinguished scientist and a Professor who has held various positions at Indian Institute of Science including Chairman, Department of Aerospace Engineering, Chairman, Department for Atmosphere and Oceanic Sciences. Having done a doctorate in Aeronautics and Physics from California Institute of Technology, USA, he was the Director of National Aerospace Laboratory, Bangalore.

Prof. Narsimha, who is a Fellow of Royal Society, UK, has made significant contributions to aerospace technology, major interest in aerospace technology, fluid dynamics and related problems in atmosphere. Dr. Sivaram also briefed the audience on NCL's Diamond Jubilee celebrations where eminent personalities are invited to give special distinguished lectures in addition to series of workshops, seminars etc. The goal is to bring as many professionals as possible from all walks of life to NCL and share with them the past, present and future of NCL.

The function concluded with Prof. Narsimha distributing mementoes to the employees who retired during the last one year, to those who completed 25 years of service, to school students who excelled in the programme organized by NCL, and to the wards of the employees who scored 90% and above marks in science and maths in their Std. XII examination. CSIR Sports Promotion Board Awards were also given on the occasion.

Dr. Ram A. Vishwakarma takes over as Director, IIIM

Dr. Ram A. Vishwakarma has taken over as Director, Indian Institute of Integrative Medicine (IIIM), Jammu, w.e.f. 12 March 2009. Prior to his becoming Director IIIM, he was working as Vice President and Head (Medicinal Chemistry Department), Piramal Life Sciences, Nicholas Piramal Research Centre, Mumbai (2005-2009). He was responsible for new drug discovery projects in the areas of inflammation, cancer, diabetes and drug-resistant infections using medicinal chemistry and natural products (medicinal plants and microbial biodiversity).

Dr. Vishwakarma's research experience spans over 28 years with focus on key areas namely organic-synthesis, biosynthesis, medicinal chemistry, drug discovery, natural products chemistry, chemical biology, glycobiology, cell and membrane-biology. He is also interested in broader understanding and assimilation of knowledge in chemistry and biology for spotting new opportunities for basic research and product development. He has demonstrated ability to collaborate with leading national and international academic and industrial research scientists while networking with scientists across various scientific disciplines to evolve new ideas and projects.

After doing his M.Sc in Organic Chemistry from Bundelkhand University, India, in 1980, Dr. Vishwakarma, joined Central Drug Research Institute (CDRI), Lucknow, for pursuing his Ph D in Medicinal Chemistry. He completed Ph D in 1987, on the



topic: *Structure, Synthesis and Medicinal Chemistry of Polyketide*. From 1991 to 1993 he pursued post-doctoral studies at the Cambridge University, England, with Sir Alan Battersby, FRS, on the biosynthesis of vitamin B complex and related porphyrins. Dr. Vishwakarma has held the following positions: Research Fellow at CDRI; Scientist at Defence R&D Organization (Government of India (1985-86); Scientist, Central Institute of Medicinal & Aromatic Plants (CIMAP), Lucknow (1986-90); Research Associate at Cambridge University (Department of Chemistry) England (1991-93); Scientist IV at National Institute of Immunology, (NII), New Delhi (1994-2000), Scientist V and VI at NII during 2000-04 .

Dr. Vishwakarma has following Professional Associations and Recognitions: Adjunct Professor, Institute of Life Sciences, Hyderabad; Medal, Chemical Research Society of India, I.I.Sc., Bangalore (2005); Member of the Editorial Board of the *Journal of Chemical Sciences* (published by the Indian Academy of Sciences, Bangalore (2008 onwards); Member, Program Advisory Committee (Organic-Chemistry), Department of Science and Technology (Ministry of S&T, Government of India) (2004

onwards); Member of Task Force (Plant Biotechnology) of the Department of Biotechnology (Ministry of S&T, Government of India) (2008-onwards); Member of Program Advisory Committee (Bio-prospecting & Molecular-Taxonomy) of the Department of Biotechnology (Ministry of S&T, Government of India) (2003-2005); Member of Expert Committee of the Council of Scientific & Industrial Research on the trans-disciplinary research (2005 onwards).

Dr. Vishwakarma has delivered more than 25 invited lectures at various International and National scientific conferences. He has been Referee for various journals published by ACS, RSC and Elsevier; while being a grant-reviewer for American (NSF), British (Wellcome-Trust), European (HSFP) Indian (DBT, DST and CSIR) national funding agencies.

Dr. Vishwakarma is Member of the American Chemical Society as well as that of Royal Society of Chemistry, England. He has been a recipient of BOYSCAST-Fellowship 1991 of DST (Government of India) for Chemical Sciences. He has supervised a number of PhD students both in chemistry and biology as he is a recognized PhD guide of the Jawaharlal Nehru University, New Delhi.

Dr. Vishwakarma has been Visiting Scientist at the following Universities: Cambridge University, England, (1991); Institute Armand-Frappier, University of Quebec, Canada, (1996); and Virginia Tech University Blacksburg USA, (2000-2001).



Dr Ch Mohan Rao takes over as Director of CCMB

Dr Ch Mohan Rao has taken over as Director of Centre for Cellular & Molecular Biology (CCMB), Hyderabad, on 12 November 2009. Dr Rao's research interests include protein folding in health and disease, molecular basis for lens transparency and cataract.

Born in Huzurabad, Andhra Pradesh, Rao obtained his B Sc. degree from the Arts and Science College (Osmania University), Warangal and M Sc.(Physical Chemistry) from Kakatiya University, Warangal. Then he joined University of Hyderabad for his Ph D programme in Chemistry. He worked on photoacoustic spectroscopy of chemical and biological systems. This work also involved modification and improvement of the system, data acquisition and processing software.

Later he joined CCMB and initiated intact lens spectroscopic investigation. During 1990-92, he visited National Eye Institute of the National Institutes of Health, Bethesda, USA and carried out investigations on stability of crystallins and the role of nucleotides in the damage to eye lens due to exposure to ultraviolet light. On his return, he initiated work on protein folding in health and disease, particularly molecular chaperone like property of alpha-crystallin and its relation to cataract, neurodegenerative diseases and cardiomyopathy. He is also investigating other heat-shock proteins such as hsp22 and hsp33.

Dr Rao's multidisciplinary expertise, including electronics, fabrication and digital interfacing

along with cellular, molecular and biophysical approaches enabled him to provide vision and leadership in several contexts. He played a key role in developing a diagnostic tool to identify a number of eye infections under the CSIR's programme on New Millennium Indian Technology Leadership Initiative (NMITLI). This product has been successfully launched commercially and adjudged the "Biospectrum product of the year (2008)". It was also awarded "Bio-Singapore Asia Pacific Biotechnology Award 2009" for the Most Important Technology Development in the Life Sciences industry.

He was a Visiting Professor at the Tokyo Science University, Japan during 1996, Visiting Scientist (Raman Fellow) at the University of Texas Medical Branch, Galveston, USA during 2000 and Visiting Professor at the Institute for Protein Research, Osaka, Japan during 2002. Dr Rao is presently the President of the Indian Biophysical Society and the Vice-President of the Asian Biophysics Association. He is a Fellow of Indian National Science Academy, National Academy of Sciences, Indian Academy of Science and Andhra Pradesh Akademi of Sciences. He was awarded the Shanti Swarup Bhatnagar Prize in 1999. Recently, he has been elected the Fellow of the Third World Academy of Sciences (TWAS), Trieste, Italy.

In addition to his outstanding research activity, Dr Rao has been playing a significant role in popularising science among the school children, science teachers and uninitiated public in general.

He is the Honorary President of Jana Vignana Vedika (JVV), a "science for the people" movement. He has actively participated in several TV and Radio programmes and written several popular science articles to promote science.



Protein Folding in Health and Disease

The problem of protein folding is a major unsolved problem in biology. Nascent protein, in the cell, has neither time nor space to fold properly. Failure of protein folding and accumulation of unfolded/aggregated protein leads to diseases. Alpha-crystallin, one of the eye lens proteins, is shown to have molecular chaperone-like property in preventing aggregation of other proteins.

The group led by Dr Ch. Mohan Rao has shown, for the first time, that Alpha crystallin can prevent photo-induced aggregation of gamma-crystallin, which may have relevance in cataract.

The group has shown temperature dependence of chaperone-like activity of alpha crystallin by using non-thermal modes of aggregation such as DTT-induced aggregation of insulin and alpha lactalbumin, photo-induced aggregation of gamma-crystallin and refolding-induced aggregation of beta crystallin. On the basis of their results, they have hypothesized that alpha crystallin prevents aggregation of non-native proteins by providing appropriately placed hydrophobic surfaces. This has

opened up the possibility of mitigating the complications arising out of protein precipitation and aggregation by enhancing chaperone-like activity of alpha-crystallin. Studies on alpha lactalbumin, carbonic anhydrase, lysozyme and RnaseA have demonstrated that crystallin binds to aggregation prone molten globule states of refolding or unfolding proteins.

Dr Ch Mohan Rao's team has investigated constituent subunits of alpha-crystallin namely alpha-A and alpha-B and found that despite sequence homology these subunits differ in stability, refolding intermediates, chaperone-like activity and temperature dependence. They have demonstrated that hetero-oligomerization induces conformational changes and these changes lead to altered functionality. The molecular modeling studies on several mutants have suggested that spatial orientation of a loop region is crucial for its activity.

They have further postulated that composition or relative exposure of alpha-A and alpha-B might help in modulating chaperone-like activity. A mutation of arginine residue in alpha-A and alpha-B crystallin leads to congenital cataract and desmin related myopathy respectively. They have cloned human alpha-A and alpha-B and introduced several site-directed mutations including arginine mutation that leads to cataract and desmin related myopathy. Their investigations have shown that R120G and R116C mutations lead to structural alterations and result in significant loss of chaperone-like activity, providing a molecular basis for the

pathology.

In order to understand the role of N-terminal domains of alpha-A and alpha-B-crystallins, N-terminal domains are swapped using a unique X_{mn}l site. Chimeric proteins thus produced showed interesting properties. One of the chimera lost chaperone-like activity completely while the other showed four-fold increase in the activity. The C-terminal extension has several charged amino acids which are thought to be responsible for solubility of the oligomer and the complex. In order to investigate the role of C-terminal extension, they swapped a stretch of C-terminal residues between alpha-A and alpha-B crystallins. One of the resulting chimeric molecules showed increased chaperone activity without significant change in the oligomer size. Dr. Ch Mohan Rao's group has shown that in addition to preventing aggregation of several proteins, alpha-crystallin can also assist renaturation of denatured carbonic anhydrase and quinone oxidoreductase to their native functional forms.

Biophysical Studies on Intact Biological Systems

Spectroscopy of intact biological systems is Dr Ch. Mohan Rao's another area of interest. By using a solid state lens holder with a specific geometry, Dr Rao's group could record the Fluorescence spectra from intact eye lenses. Studies using this approach have resulted in the demonstration of supra-molecular features in the lens that were not observed in earlier solution state studies. They adopted synchronous scan fluorescence to investigate several fluorophores in intact lenses.

The group investigated the

mobility of tryptophan residue and its change upon irradiation of lens by Red Edge Excitation Shifts (REES). This was the first application of REES to intact biological sample. The other possible applications are in molecular ensembles such as micelles, reverse-micelles and bio-membranes. REES has been proven to be a useful approach for investigating fragmental mobility and inter-protein interactions.

Photoacoustic spectroscopy of Dr Rao's group is a convenient tool for investigating intact biological systems. Based on the investigations on the red blood cells from the animals suffering from malaria and treated with various quinoline class of drugs, a scheme for the mode of action of quinoline class of anti-malarial drugs was proposed.

Photoacoustic spectroscopy is eminently suitable for depth profiling. By using phase resolved spectroscopic approach, Dr Rao's group could demonstrate that the carotenoid pigment is largely localized in the membrane region of bacteria collected from Antarctica. The photoacoustic spectroscopic approach resulted in cellular localization and monitoring of time-dependent movement of an anti-tumor drug in a cell line.

Dr Rao's group has further investigated the effect of oxidative stress on the lens metabolism and integrity by studying the lenses in organ culture. They have shown that the sodium/potassium pump is compromised in the organ-cultured lenses that are exposed to isotonic smoke condensate. They have also shown that anti-oxidative agents can neutralize part of this effect.



Dr. Suresh Das Takes Over as Director, NIIST

Dr. Suresh Das has taken over as Director of the National Institute for Interdisciplinary Science & Technology (NIIST), Thiruvananthapuram w.e.f. 28 October 2009.



Dr. Das's areas of expertise are: Photochemistry, Liquid Crystals, Near Infrared Absorbing Dye, Dye Sensitized Solar Cells, Supramolecular Chemistry, Photo Responsive Materials and Crystal Engineering.

Dr. Das did his B Sc. from University of Poona in 1975; M Sc. from the University of Baghdad; Iraq, in 1977; and Ph D from the University of Newcastle UK, in 1981. Dr. Das has held the following positions: post-doctoral Fellow at Max-Planck Institute für Strahlenchemie, Mülheim a.d.Ruhr, Germany during 1981-84; Radiation Laboratory, University of Notre Dame, Indiana, USA (1984-85); University of Houston, Texas, USA (1985-88); Visiting Fellow at Tata Institute of Fundamental Research, Bombay, (1988-89). He worked as Head, Photosciences and Photonics Section (Formerly, Photochemistry Research Unit) during 1989-2007, and as Head, Chemical Sciences and Technology Division from 2004 onwards at NIIST, Thiruvananthapuram. He worked as Visiting Scientist at Radiation Laboratory, University of Notre Dame, USA during 1998-99, at Max Planck Institut fuer Biophysikalische Chemie, Gottingen, Germany (1999 & 2000) and at NIAIST, Tsukuba, Japan, from 2003-2007.

Dr. Das has about 150 research papers, and three US patents to his credit. He has been recipient of several awards and honours. These are: Fellow of the Indian Academy of Sciences, Bangalore (2005); Silver Medal, Chemical Research Society of India (2009); Materials Research Society of India Medal (2007). Dr Das is also a Council Member, Asian and Oceanian Photochemical Society (2002-present); Council Member Chemical Research Society of India (2008-present); Editorial Board Member, *J. Photochem. Photobiol. A: Chem* (2004-present); Convener, Chemical Research Society of India, Trivandrum Chapter. Besides, he was conferred Bronze Medal, Chemical Research Society of India (2000); and INSA-JSPS Visiting Fellowship (2003).

Prof. Harinarayana Felicitated by Andhra University, Visakhapatnam



Prof. Bela Satyanarayana, (right) Vice Chancellor, Andhra University, Visakhapatnam, and Prof. P. Rajendra Prasad (left), Principal, Science College and RC member, NGRI, felicitating Dr.T.Harinarayana

Dr. T. Harinarayana, Head, Magnetotellurics Division and Director's Grade Scientist, National Geophysical Research Institute (NGRI), Hyderabad, has been felicitated by the Department of Geophysics, Andhra University, Visakhapatnam on the occasion of its Diamond Jubilee celebrations (1949-2009). Prof. B. Satyanarayana, Vice-Chancellor of Andhra University and Prof. P. Rajendra Prasad, Principal, Andhra University Science college, Visakhapatnam felicitated Prof. Harinarayana on 11 December 2009. He was invited to work on Marine Controlled Source Electromagnetics (CSEM) by the University of Texas at Austin as a visiting scientist during May-November 2009. Presently, he is the senior most National Mineral Awardee (1991) of NGRI. He was elected to the prestigious Russian Academy of Natural sciences (RANS), Moscow and has developed collaboration projects with Russian scientists under ILTP, and Bulgarian scientists under Indo-Bulgarian scientific cooperation to develop geothermal resources. Based on his work, geothermal energy development projects to generate power are being taken up by NTPC Ltd in Uttarkhand and also in other states under NGRI-NTPC Memorandum of Understanding. He is instrumental in introducing a new geophysical technique — *Marine Magnetotellurics* — in India for oil exploration in the Gulf of Kutch region of Gujarat.



Dr. S. Sivaram Conferred ICC D. M. Trivedi Lifetime Achievement Award



Indian Chemical Council has conferred ICC D. M. Trivedi Lifetime Achievement Award on Dr. S. Sivaram, Director, National Chemical Laboratory, Pune, for his contributions to Indian Chemical Industry (Education & Research) for the year 2008.

Dr. Swaminathan Sivaram is a polymer chemist, mentor and science manager of distinction. Dr. Sivaram has over 40 years of experience in basic research, process/product R&D and S&T management, both in industry and academia. He is widely recognized for his contributions to polymer science, technology development, institution building and management of innovation in publicly funded organizations. An alumnus of IIT-Kanpur (M Sc. 1967), he received his Ph D in Chemistry from Purdue University, W. Lafayette, Indiana, USA, working with Prof Brown, a Nobel

Prize winner in 1971. After a brief stay as a Research Associate at the Institute of Polymer Science, University of Akron, USA, with Prof. J. P. Kennedy, he joined the Research Centre of Indian Petrochemicals Corporation Ltd, at Vadodara, Gujarat. In 1988, he joined NCL as Head of the Polymer Chemistry Division. Dr. Sivaram built an impressive portfolio of polymer research activities at NCL, both with Indian companies and global multinationals like GE, Ciba, DuPont and others, making NCL a preferred destination for companies far and near to explore research collaboration through a partnership model. He also built a globally recognized research group in polymer science at NCL.

Dr. Sivaram is a recipient of the Vishwakarma Medal (INSA), Silver Medal of the Chemical Research Society of India, Millennium Medal of the Indian Science Congress

Association, Distinguished Alumnus Award of IIT, Kanpur, Professor S. R. Palit Memorial Award of the Indian Association for Cultivation of Science, K. G. Naik Gold Medal of M.S. University, Baroda, FICCI Award in Physical Sciences and Om Prakash Bhasin Award.

Dr. Sivaram was awarded the *Padma Shri* by the President of India in 2006. He is also the recipient of J. C. Bose Fellowship of the Department of Science and Technology, Government of India for the period 2007-11. As a member of the Award Selection Committee of ICC Dr. Sivaram has assisted the Council in selecting the recipients for various categories of Awards.

The Financial Express
December 4, 2009 Friday
New Delhi

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (HUMAN RESOURCE DEVELOPMENT GROUP) CSIR COMPLEX, Library Avenue, Pusa, New Delhi 110 012

NOMINATIONS INVITED

CSIR Young Scientist Awards for 2010

The Council of Scientific & Industrial Research (CSIR) invites nominations for the CSIR Young Scientist (YS) Awards for the year 2010. The awards are to be given for research contributions made primarily in India. The nominee should be a regular employee of CSIR system holding a position of a Scientist in Group IV and he/she should have joined before 26 September 2009. The age of the nominee should not be more than 35 years as on 26 September 2009.

The YS Awards are given annually in the following disciplines: (1) Biological Sciences, (2) Chemical Sciences, (3) Earth, Atmosphere, Ocean and Planetary Sciences, (4) Engineering Sciences, and (5) Physical Sciences (including instrumentation). The YS Award comprises a citation, a cash award of Rs.50,000 (Rupees fifty thousand only), and a plaque.

Nominations should be addressed to Dr Rajesh Luthra, Head, Human Resource Development (HRD) Group, CSIR Complex, Library Avenue, Pusa, New Delhi 110 012, and should be sent as per the prescribed proforma (20 copies) along with one set of research papers published during the last 5-year period, by 31 January 2010. The details of the YS Award and the prescribed proforma for nomination can be obtained from above address or may be downloaded from website: <http://csirhrdg.res.in>



5th International Symposium on Biological and Environmental Chemistry of DMS(P) and Related Compounds, 19 - 22 October, 2010

Venue: National Institute of Oceanography (CSIR) Dona Paula, Goa

Aerosols and clouds play an important role in reducing the amount of solar radiation that reaches the Earth. The clouds help by acting like a 'mirror' reflecting part of the incident solar radiation. Earth would be far hotter without this cooling mechanism. Clouds are formed by the aggregation of moisture and aerosols. The moisture comes from evaporation and the released aerosols have both anthropogenic and natural sources. Whilst industry is the dominant source of the man-made aerosols, natural aerosols are released at the earth surface in the form of dust and sea spray. Aerosols also form in the atmosphere from biogenic gases emitted at the Earth's surface. Dimethylsulphide (DMS) is perhaps the most important marine biogenic gas that contributes to white clouds in the atmosphere and facilitates higher reflectivity and cooling.

The role of DMS in climate was first highlighted in the 1970's, but we still do not completely understand its mechanisms of formation and fate. DMS is derived from a major algal precursor dimethylsulphoniopropionate (DMSP). The biological reasons for DMSP production by phytoplankton are not clear although several theories on its role as osmolyte, anti-grazing compound, anti-bacterial and anti-oxidant have been proposed. Similarly, the fate of DMSP in seawater is

important because decomposition doesn't always lead to DMS formation. The biogenic DMS undergoes transformations before forming the sulphate aerosols in air. The hygroscopic sulphate aerosols condense along with other constituents in atmosphere leading to the formation of condensation nuclei (CN) and cloud CN (CCN), which are important in the formation of clouds and rain.

One of the major mechanisms for stimulating research on the production of DMS is the periodic review of research progress. Realizing this, the DMS(P) community has been organizing international meetings in a series. The 'International Symposium on biological and environmental chemistry of DMS(P) and related compounds' have been held roughly once every four years: the 1st Symposium in Mobile, USA (5-8 June 1995); the 2nd in Groningen, The Netherlands (25-28 August 1999); the 3rd at Rimouski, Canada (26-28 September 2002); the 4th in Norwich, UK (2-6 May 2006). The 5th in the series is being organized at the National Institute of oceanography (NIO), Goa, India, during 19-22 October 2010.

The scientific objectives of the 5th International DMS(P) Symposium are to:

- Facilitate world 'DMS(P) and related compounds' community interactions and promote related

research.

- Review the recent advances on DMS(P) and related compounds biological and environmental research;
- Document the advanced understanding in a special issue of a reputed journal, and
- Identify new areas for DMS(P) research with particular focus on relating phytoplankton to climate.

The symposium will comprise invited talks, offered talks, poster presentations, and open to all aspects of research related to the Symposium.

Registration Fee

International: US\$ 125/- per scientist
US\$ 50/- per student

Indian: Rs 2,500/- per scientist
Rs 1,000/- per student

Registration

Opens on line on 1 February and closes 31 July 2010

Abstract submission

Opens on line on 1 February and closes 31 July 2010

Accommodation

On line reservation facility from 1 February

For further details please contact

Dr. Damodar M. Shenoy at dmshenoy@nio.org

Printed and Published by Deeksha Bist on behalf of National Institute of Science Communication And Information Resources (NISCAIR), (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 P. Cheena Chawla; **Associate Editor:** Meenakshi; **Editorial Assistant:** Neelima Handoo, **Editorial help:** Dr Sukanya Datta

Design: Neeru Sharma; Sarla Dutta; **Production:** Kaushal Kishore;

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

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

For subscription: The Sales & Distribution Officer, NISCAIR; E-mail: sales@niscair.res.in; Annual Subscription: Rs 300; Single Copy: Rs 15.00
Subscription Complaint No: 25843359