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C O N T E N T S

Unravelling our Genetic Diversity



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International Symposium



Appointment



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Genetic Diversity in Indian Populations

A New Door Opened

Dr. P. Cheena Chawla

Home to more than one billion people, India is a land of matchless diversity in diverse ways. With scores of culturally diverse communities inhabiting the nation, each portraying a different language, religion, set of customs and cuisine, India is not only ethnically distinct that is much apparent but the human populations of this country are also distinct at the level of genes — the hereditary material that is passed on from one generation to the next — thanks to novel findings of a joint team of Indian and American scientists, with key players from the Centre for Cellular and Molecular Biology (CSIR), Hyderabad, India. The US researchers are from Harvard Medical School, the Harvard School of Public Health and the Broad Institute of Harvard and MIT.

Interestingly, if we look at our genetic material that biochemically comprises the DNA molecule, any two unrelated individuals surprisingly differ just by 0.1%, as the remaining 99.9% of DNA is completely identical. What an irony then that all the amazing human diversity, at the level



Housed in the nucleus of every body cell, chromosomes are vehicles of our genetic material

of genes, is housed only in this variable, and apparently tiny, portion of our DNA! It is this region of DNA, comprising some three million base pairs, that is a storehouse of clues to a rich source of information, and has today helped scientists to



Lalji Singh (left) and Kumarasamy Thangaraj — The key Indian players whose work unravelled the genetic distinctiveness of different Indian groups

reconstruct the historical origins of human populations in India. It is also the region of our genetic material, which clearly points to the many genetic variations in human beings that make select individuals at a higher risk of certain diseases as compared to others.

For this study on ascertaining genetic variability across various human populations in India, about 5.6 lakh genetic markers were analyzed across the genomes of 132 individuals who were selected from 25 diverse groups in India that represented 13 states comprising all six language families, traditionally upper and lower castes, as well as tribal groups. An important revelation of the new study led by Lalji Singh and David Reich, published in 24th September 2009 issue of *Nature*, is that different Indian groups carry genomic material from two distinct ancestral populations – the ‘Ancestral North Indians’ (ANI) who are related to western Eurasians, from whom the Indian populations have inherited 40-80% of their ancestry and the rest from ‘Ancestral South Indians’ (ASI) who are not related to any group outside India. The ANI ancestry has been found to be significantly higher in Indo-European than Dravidian speakers, which suggests that populations descending from ASI may have spoken a Dravidian language before mixing with populations descending from ANI.

India Cracks the Human Genome

In a ground breaking work, CSIR scientists at the Institute of Genomics and Integrative Biology (IGIB), New Delhi, have completed the first human genome sequencing in India, setting the stage for India's entry into individual genomics, which is poised to open new possibilities in disease diagnostics and treatment. The genome that has been sequenced is that of an anonymous healthy individual from Jharkhand. While the first human genome sequencing took over a decade, and a whopping 3 billion US dollars to complete the task, CSIR has bagged the unique credit for accomplishing the same in only 45 days,



The Supercomputing Facility at IGIB (*top*) and DNA Sequencing Machine (*above*)

spending Rs. 15 lakhs (US\$ 30,000).

The IGIB scientists triumphantly generated over 51 gigabases of data, using the most sophisticated sequencing technology that enables massive parallel sequencing of millions of fragments of the genetic material, as small as comprising only 76 base pairs. These small DNA fragment once sequenced, are then mapped back to the reference genome. This herculean task of finding the sequence of the entire human genetic material, comprising three billion base pairs, was possible due to the CSIR supercomputing facility at IGIB. With this achievement, India has become the sixth country after US, China, Korea, Canada and UK, to demonstrate the capability of sequencing and assembling a complete human genome.

Understandably, sequencing of the human genome requires high computational capability and technological know-how in handling sophisticated machines and analyzing huge volume of data. The first human genome sequencing initiative was conceived as early as 1984. In addition to the United States, the 'International Human Genome Project Consortium' comprised geneticists from United



The triumphant Indian team (*from left*): Ashok Patowary, Vinod Scaria, Sridhar Sivasubbu and Ramya Purkanti

Kingdom, France, Germany, Japan and China. The International Human Genome Project formally started in 1990 and was completed in 2003, sequencing the genomes of Craig Venter, James Watson and an anonymous Chinese individual. Till now, only 14 individual genomes have been sequenced worldwide. CSIR could achieve this by adapting to new technologies and effectively integrating complex information technology tools with analytical capabilities.

The sequencing of the human genome would help us to understand the variations at genetic level that make two individuals different. More importantly, since there is an association between the genetic variants and predisposition to diseases, human genome sequencing would be enormously important in diagnosis and management of various diseases including cancer. Interestingly, the sequencing of the Indian genome has revealed a large number of hitherto unknown variations that include single nucleotide polymorphisms (SNPs) as well as many insertion/deletions in our genetic material. Understanding the functional role of these variations would, for sure, throw light on identifying the

markers linked to specific diseases, which could be specifically hunted for predicting diseases before they spell disaster.

Earlier this year, CSIR scientists also completed the genome sequencing of zebrafish – an organism popularly used to model human diseases – that has half the size of the human genome. With this feat, India became the first country to sequence the wild type strain of zebrafish.



Another Door Opened

Genetic Diversity Mapped in Asia

Housing 60% of the human inhabitants of planet Earth, Asia – the world’s largest continent – is a huge melting pot of genetic diversity. The contributors of this exceedingly rich human resource are the scores of unknown ancestors who migrated from different parts of the world and settled down in this region over thousands of years.

Ancestral human populations are believed to have originally spread out from Africa, from where they slowly began to adapt different parts of the globe due to the pressures of climate, food and health conditions. The present genetic human diversity of the Asian populations is all due to these best adapting individuals, who proved most fit to survive in a given place. It is the tracking down of the ancestry of the human populations, through certain tell-tale signs written in every person’s genes, that has today empowered scientists to remarkably establish a link between two geographically separated groups of people.

For the first time, to understand the genetic history of the people living in Asia, over 90 scientists from the Human Genome Organization’s (HUGO’s) Pan-Asian SNP Consortium have undertaken the human genetic mapping of Southeast Asian (SEA) and East Asian (EA) populations, the findings of which have been published in the 10th December, 2009 issue of *Science*. The hallmark of this human ingenuity is nothing but the tracing of certain ‘marker’ genes

that for example, may bestow the individual an advantage of better survival in a particular environment, or a disease-gene marker which could be tracked back in time to discover the human population from where that altered/mutated gene may have originated.

In this unique attempt 1,928 unrelated individuals representing 73 populations from 10 countries and 10 linguistic lineages from mainland China, India, Indonesia, Japan, Malaysia, the Philippines, Singapore, South Korea, Taiwan and Thailand were studied.

For establishing genetic differences between two unrelated individuals, scientists basically look at more than three million differences in their genes. Variations at the level of single nucleotides, are commonly referred to as single nucleotide polymorphism (SNP). Therefore, it is the tracking of genetic variations through human migrations that provide clues to evolution of diseases and genetic diversity.

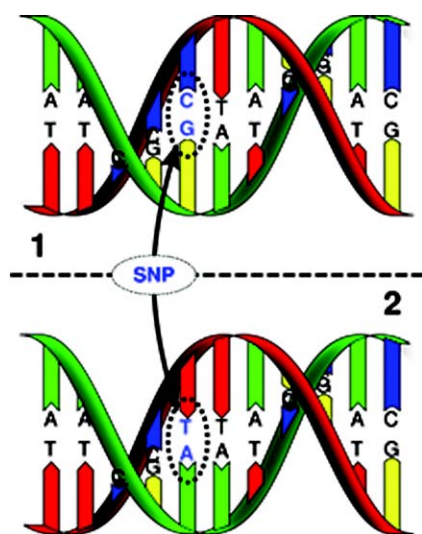
Genotyping of more than 50,000 SNPs was done at eight different centres while the filtering of collected data was centralized to maximize the standardization of results. This genetic mapping of people inhabiting different parts of Asia has opened the door to understand the migratory patterns in human history as well as the genetic basis of many diseases afflicting human populations of this region.

This study has today revealed that

populations from the same linguistic group tend to cluster together, which means that there is considerable relatedness within ethnic/linguistic groups. It has also revealed that there was a south-to-north migration of East Asians, which means that the majority of East Asian gene pool has been derived from Southeast Asia. According to the study, the most recent common ancestors of Asians arrived first in India. Later, some of them migrated to Thailand, and also South to Malaysia, Indonesia, and the Philippines.

The first group of settlers must have gone very far south before they settled successfully. These included the Malay Negritos, Philippine Negritos, the East Indonesians, and the early settlers of the Pacific Islands. Later, one or several groups of people migrated North, mixed with previous settlers there resulting in various populations now known as Austronesian, Austro-Asiatic, Tai-Kadai, Hmong-Mien, and Altaic etc. Interestingly, most of the Indian population showed evidence of shared ancestry with European population.

Signifying the essence of this work, nothing can better echo the sentiments of scientists than the words of Professor Samir Brahmachari, Director General, CSIR: “*We have breached political and ideological boundaries to show that the people of Asia are linked by a unifying genetic thread.*”



Variations in single nucleotides of the DNA molecule, called SNP's, act as excellent genetic markers

For analyzing the genetic markers, which are the regions of genetic variations occurring as single nucleotide polymorphisms (SNPs), the blood samples of select individuals of 25 diverse groups of India were collected. After DNA extraction from these samples, all DNA samples were genotyped on Affymetrix 6.0 arrays or DNA chips, and analyzed for genetic variations in 560,123 SNPs. Scientists then employed novel statistical approaches for studying the genetic variations in these individuals of diverse groups. Allele frequency differentiation among the groups as well as inbreeding in each group were assessed using sophisticated software. A novel toolkit has also been developed by scientists for understanding the relationships among population groups, thus tracing their history of origin.

This novel work has thus revealed, through modern genomic technology, that almost all Indian groups, including the traditional 'tribes' as well as 'castes', have descended from the mixtures of

ANI and ASI ancestral populations. A significantly higher ANI ancestry has been found in traditionally upper castes than in middle/lower caste groups. According to Kumarasamy Thangaraj, a senior research scientist at CCMB, it is impossible to distinguish castes from tribes using the data, which supports the view that castes grew directly out of tribal-like organizations during the formation of Indian society.

The new study has also revealed that the Andamanese – a small population of indigenous people of the Andaman Islands – appear to be related exclusively to the Ancestral South Indian lineage and completely lack Ancestral North Indian ancestry. This surely opens a door to the history of the Ancestral South Indians who diverged from other Eurasians, probably tens of thousands of years ago.

Genetic variation studies on tribal populations, who have been locked away from the modern world, is the key to unlock not only the mystery of our own origins but is also important for understanding the genetic basis of complex diseases. Many of the environmental risk factors related to modern lifestyles, such as intake of unhealthy diet and lack of physical exercise, which are at the crux for triggering many complex diseases, are usually uncommon in tribals. Therefore, with studies on primitive, isolated tribal populations, it would be possible to differentiate genetic factors from environmental risk factors for these diseases. In this direction, CCMB has undertaken a very large project on studying the human genetic diversity in tribal and caste populations of India in collaboration with Anthropological

Survey of India.

It has also come to light that the ancestry of many groups in modern India could be traced back to a small number of founding individuals, which explains why these groups have remained genetically isolated from other groups for thousands of years, with limited gene flow due to endogamy or marriages within the group. Such 'founder events', as they are popularly called, are the root cause of the exceptionally high incidence of some genetic diseases among only Indians. According to Lalji Singh, former Director of CCMB and a Bhatnagar Fellow whose pioneering efforts in this field are commendable, India is genetically not a single large population, but comprises many smaller isolated populations that have descended from several founder events.

Just as founder events are known to increase the incidence of recessive genetic diseases in other human populations like Finns and Ashkenazi Jews, the same could most likely be the case for many groups in India, where inter-caste marriages are a taboo. According to researchers, the founder effects are responsible for an even higher burden of recessive diseases in India than consanguinity. For confirming this, the next step according to researchers would be to carry out a systematic survey of Indian groups for identifying the communities that have descended from the strongest founder events. This would help in pinning down the culprit genes responsible for causing many devastating genetic diseases, thus opening the door to finding effective therapies and providing appropriate clinical care to the affected individuals and those at risk.



The history of population structure in India, therefore, has its root in two ancestral populations — ANI and ASI — and it is the rampant mixture of these populations that is the hallmark of all the amazing genetic variations in many Indian groups. The concepts of ancestral genomic content, their mixture throughout India and importance of founder events have assumed significance, for these have serious

implications on the health of the Indian populations.

The scope of further research in this field would be to estimate a date when the mixture of these populations might have occurred. For this, a detailed study of the length of genetic stretches of ANI ancestry in Indian samples might be undertaken. Another area that needs to be explored in greater detail is the history of ANI and ASI populations

before they began to be mixed.

India, the world's second most populous nation is uniquely distinct for its varied diversity. Be it geographic or climatic diversity, be it the diversity in languages, religions and cultures of its people, or be it the genetic diversity as evident today, after all it is our very diversity that imparts strength to our oneness.

Spacer-Aided-Initiation in Solid Blasting

A CIMFR Patented Method

Coal production from underground mines in India has been stagnating for over last three decades. Production from underground coalmines has to be increased for sustainable growth of Indian coal mining industry. The Bord and Pillar method contributes about 95% of the total underground coal production in India. Solid blasting using P_5 type permitted explosives is the predominant method of blasting during drivage of in-seam galleries in Bord and Pillar method and it contributes about 60% of underground coal production (i.e. around 35 million tonne) in India.

Solid blasting in Indian underground coal mines has always suffered from low productivity since its inception in 1969, as P_5 explosive is the weakest of all permitted explosives, having limitation on its maximum charge weight per holes. An average pull (i.e. advancement of face per round of blasting) of 1.0 - 1.2 m and yield of 12 - 18 tonnes per blast in solid blasting with gallery dimensions of 3.5 - 4.5 m width and 2.0 – 3.0 m height in different geo-mining conditions have never been considered satisfactory for optimum utilization of men and machines. This is more so with introduction of semi-mechanization in most of the underground coalmines in the recent past in India. There has not been any innovation in the last four decades for improving pull and yield per blast in solid blasting. Improvement in performance of solid blasting is, therefore, necessary for optimum utilization of men and machines at

the face and thus improving production and productivity of underground coalmines.

Explosive & Explosion Laboratory of CIMFR conceived and filed a patent through CSIR in India (Patent Filing No. 1538DEL2005, dated 10.06.2005) on a method of solid blasting in underground coalmines using spacer-aided-initiation for achieving longer pull. This method of spacer-aided-initiation in solid blasting envisages distribution of explosive energy over longer length of shot hole by the use of plastic spacers for air decking of cartridges of suitable P_5 explosives with single priming at one end for achieving longer pull.

Considering success of air decking of explosives in improving blast performance in opencast mining and tunneling, air decking of P_5 explosives in longer holes in solid blasting was expected to increase the pull and yield per blast provided unfailing detonation of receptor cartridges was ensured by suitably selecting the explosive and the length of air decks in the plastic spacers. The length of air decks should not exceed the maximum distance over which the detonation wave from a primed cartridge can jump to the receptor cartridges under practical usage conditions.

Failure of transmission of detonation wave from the primed cartridge to the subsequent ones in a blast hole may cause misfire of the receptor cartridges. Misfired cartridges under the action of heat and pressure generated by the detonation of other cartridges in same or adjacent holes can



lead to their deflagration, which can be a grave hazard in underground coalmines. Use of plastic spacers for providing air gaps between the cartridges should not add significantly to post detonation toxic fumes generated by the explosives so as to exceed the permissible limits. Therefore, misfire, deflagration and increase in post detonation fumes were apprehended hazards of using CIMFR's patented method of spacer-aided-initiation in solid blasting in underground coalmines.

Under a Ministry of Coal funded S&T project titled, *Optimization of Production from Blasting off-the-Solid (BOS) by Achieving Longer Pull (Phase-I)*, Explosive & Explosion Laboratory of CIMFR studied all relevant parameters under simulated conditions in the laboratory and in an opencast mines of SCCL to establish safety and efficacy of using spacer-aided-initiation in solid blasting in underground coalmines. The results of this Project revealed that any apprehension of misfire, deflagration and increase of toxic gases beyond permissible limits with use of proposed innovation of spacer-aided-initiation in solid blasting for achieving higher pull can be eliminated by proper selection of explosive and the length of spacer. Necessity was felt to develop a new permitted P_5 explosive having 15-20 cm air gap sensitivity for use with this CIMFR method.

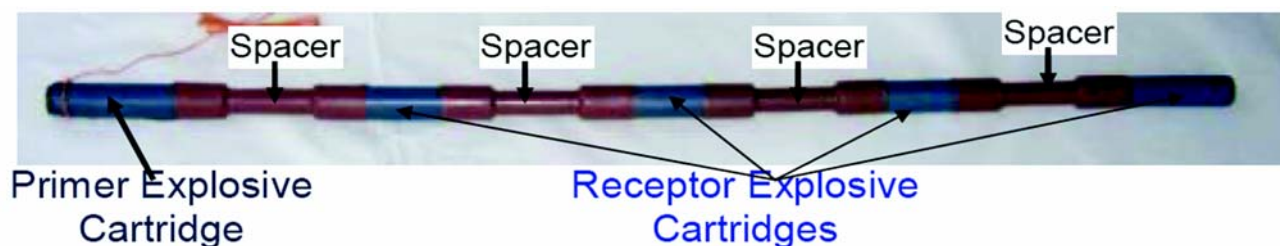
CIMFR guided M/s Gulf Oil Corporation Limited, Hyderabad, for the development of a unique slurry explosive namely, *Pentadyne-HP* (code no.: *PE-5U*) which met all the statutory requirements of P_5 explosive and passed 15 cm air gap sensitivity in open unconfined conditions. Laboratory trials of different explosives with varying weight of spacers proved that newly developed non-deflagrating Pentadyne-HP explosive can be used for air decking up to 15 cm in solid blasting using high density polyethylene (HDPE) spacers, similar to that used in Blasting Gallery panels of weight not more than 21g without exceeding the

toxic gases beyond permissible limits. Based on the results of studies conducted by CIMFR, the Directorate General of Mines Safety (DGMS), which is the custodian of safety in mines in India, approved for the first time the use of spacer-aided-initiation in solid blasting with Pentadyne-HP in underground coalmines.

The field trial of Pentadyne-HP with air decking using HDPE spacers of 15 cm length in solid blasting was conducted in GDK-5 incline of Singareni Collieries Company Ltd (SCCL), Singhali Colliery of South Eastern Coalfields Limited (SECL), a subsidiary of Coal India Limited (CIL) and Milupara mine of M/s Monnet Ispat & Energy Limited, Raigarh consuming around 1400 kg of Pentadyne-HP explosive with great success without a single occurrence of misfire, deflagration or increase in toxic gases beyond permissible limits in post detonation gases.

During the field trials of Pentadyne-HP with CIMFR's patented method of spacer-aided-initiation in solid blasting in GDK-5 incline, pull up to 1.7 m with shot holes of 1.8 m length and 2.2 m with shot holes of 2.4 m length could be achieved with yield ranging from 27 to 50 tonne per blast depending on the face dimensions ranging from 3.2 - 4.2 m width and 2.5 - 4.0 m height. Thus, an improvement in pull and yield by 60% to 120% were achieved using CIMFR patented method which is quite significant considering the fact that there has not been any innovation in solid blasting since its inception in 1969.

Based on the outstanding performance of spacer-aided-initiation in solid blasting with Pentadyne-HP, DGMS has approved its commercial use in degree-I gassy mines. This method is now being tried by SCCL and CIL managements in some of their selected mines before full-scale application in all the mines. Thus, the new CIMFR patented method has a huge potential in improving the productivity and cost-effectiveness of Indian underground coalmines.



Concept of spacer-aided-initiation in solid blasting in underground coal mines



Studies on the Impact of Atmospheric Aerosols on Regional Climate Systems

Shanti Swarup Bhatnagar Prize winner: *Prof. S. K. Satheesh*

Prof. S. K. Satheesh of the Centre for Atmospheric and Oceanic Sciences, Indian Institute of Science (IISc), Bangalore, has been awarded Shanti Swarup Bhatnagar Prize for 2009 in the discipline Earth, Atmosphere, Ocean and Planetary Sciences for his contributions to the studies on impact of atmospheric aerosols on regional climate systems such as Indian monsoons. [*CSIR News*, 59 (2009), 303].

The major focus of Prof. Satheesh's research work was on the impact of atmospheric aerosols on regional climate systems such as Indian monsoons. Aerosols are tiny particles suspended in the atmosphere, popularly known as air pollution. In addition to their impact on human health, they have the potential to alter regional climate through different mechanisms. Aerosols are of natural and man-made or anthropogenic origin. On a global scale, the natural sources of aerosols are stronger than anthropogenic counterparts. But regionally this is not the case. Over major source regions, such as cities, anthropogenic sources can be larger by several factors compared to natural sources. In such cases, increased abundance of aerosol can also cause serious health problems such as respiratory diseases.

Several studies have suggested that aerosols may be mitigating global warming, although aerosol effects on climate are still uncertain as outlined in the International Panel of Climate Change (IPCC) reports. Compounding to the complexity of this problem is the interaction of aerosols with clouds. It is very difficult to form clouds without small aerosol particles acting as "seeds" to start the formation of cloud droplets. Thus, aerosols can control the cloud properties and alter rainfall patterns.

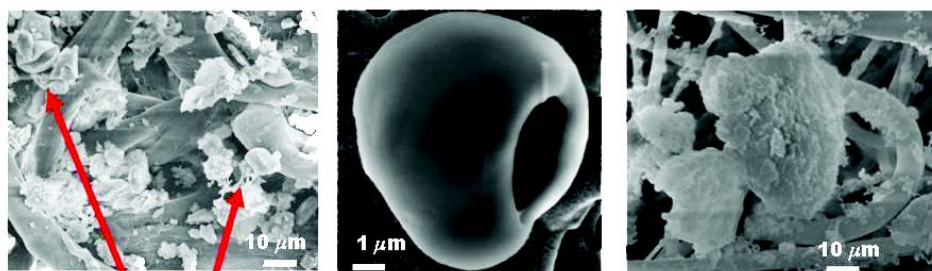
Among the various aerosol types, black carbon aerosols produced from automobiles and biomass burning assume great importance due to their high absorption characteristics. The most alarming fact is that black carbon aerosol may lead to increased atmospheric warming and hence, compliment to warming by the green house gases.

There are several crucial questions on aerosols that the climate change community has been trying to answer. These include, Whether aerosols warm the planet, thus accelerating the global warming? What is the impact of aerosols on cloudiness and rainfall? Can aerosols alter natural hydrological cycle?

The basic question is: why do we, the Indian scientific community, care about aerosols? Our observations over India for the last two decades show a five-fold increase in aerosol abundance. In fact, over many cities in India, pollution levels are much above than permitted. This alarming rate of increase in aerosol in just two decades is not surprising. The number of registered vehicles has



Particle Shape and State of Mixing

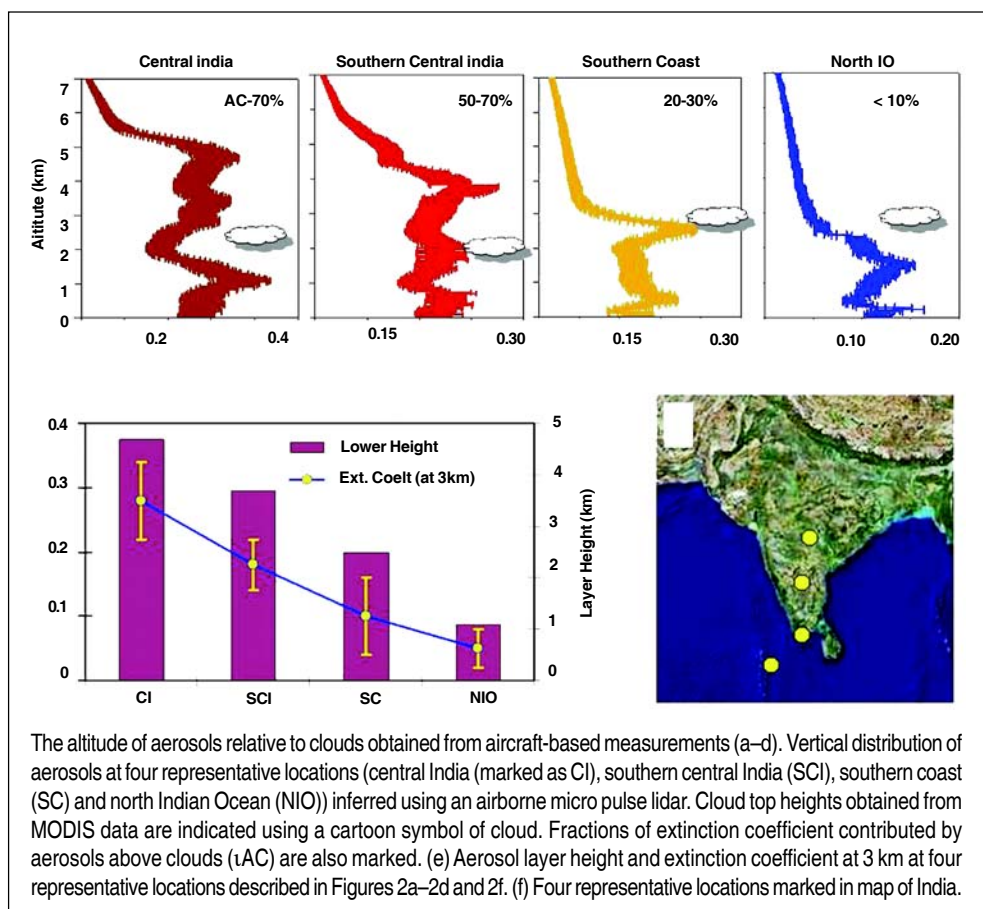


Hollow Particle

Hollow Particle (amplified)

Large Mixed Particle

Scanning electron microscope pictures of hollow aerosols and 'mixed' aerosols



state is particularly important over the Asian region, which is unique in aerosol perspective as natural and anthropogenic aerosols co-exist.

The role of aerosols on the Indian monsoon is not yet understood well. Studies done by Prof. Satheesh earlier have shown that low pressure regions created by aerosol warming over Indian landmass draws in warm and moist air over the Indian sub-continent leading to the advancement and subsequent intensification of Indian summer monsoon. That means increased presence of aerosols leads to more rainfall. But recent investigations have shown that a large reduction of solar radiation reaching the Earth's surface by anthropogenic aerosols might slow down the hydrological cycle. Such reduction in solar radiation by aerosol is popularly known as *global dimming*. Impacts of *global dimming* can be devastating.

gone up from two million to more than 100 million during this period. There was a substantial increase in industries as well, which together with increase in urban population and traffic has contributed to a dramatic rise in air pollution.

According to observations made by Prof. Satheesh and his team of scientists, the clear-sky atmosphere absorbs more short-wave radiation than predicted by existing models. Several investigators have hypothesized the presence of 'unidentified' absorber in the atmosphere, which has optical properties similar to that of aerosol black carbon. These investigations have proved that these models consistently underestimate aerosol absorption. Investigations by Indian scientists, led by Prof. Satheesh have suggested that one of the possible causes of this 'excess' absorption could be changes in the state of mixing of black carbon (BC) in aerosol at different locations. These findings imply that the actual radiative impact due to aerosols is much larger than the estimates made in the past. The treatment of aerosol in mixed

Modeling studies indicate that serious drought over Northern Africa during 1980s, which lead to the death of over one million people and afflicted 50 million more with starvation, was due to *aerosol dimming* effects. Thus, *dimming* can have a detrimental impact on the Asian monsoons which bring rainfall to half of the world's population. Decrease of crop yield, mainly rice and wheat, is another major consequence of such a *solar dimming* due to aerosols.

The observations made by Satheesh's group (ground-based, aircraft-based and space-borne) show that aerosol loading is highest over Indo Gangetic basin with Himalayas in the north. They have also found that aerosol over Indo-Gangetic basin is dominated by black carbon aerosols and are distributed over an altitude of up to 5 kms. Fast increase in aerosol abundance and its distribution to high altitudes close to Himalayan region is a disturbing fact, as increased warming by aerosol at higher atmospheric levels can cause



Biographical Sketch

Dr S. K. Satheesh is currently an Associate Professor at the Centre for Atmospheric & Oceanic Sciences, Indian Institute of Science, Bangalore, India. He has published around 100 articles in peer reviewed journals and his work is cited more than 1800 times by peers. He has lead or participated in numerous field campaigns for measuring aerosols and radiation both in India and abroad. He has been involved in the design and/or fabrication of laboratory instruments as well as satellite sensors for the measurement of aerosols and radiation locally and globally. He has also developed several new methods in satellite remote sensing of aerosols and has been involved in simulating the impact of anthropogenic aerosols over Indian region on regional climate (monsoon and temperature distribution) using atmospheric general circulation models.

Prof. S.K. Satheesh completed B.Sc. and M.Sc in (Physics) from University of Kerala and PhD from Vikram Sarabhai Space Centre (ISRO) and University of Kerala based on research conducted during 1993-97. He then joined Scripps Institution of Oceanography, University of California, San Diego, USA as a Post Doctoral Fellow. In 2000, he joined the Indian Institute of Science.

Prof. S.K. Satheesh is a recipient of several national and international awards and has many other distinctions such as: several American Geophysical Union (AGU) highlighted articles, three review articles, three papers cited more than 100 times, total citations exceeding 1800, besides delivering numerous invited lectures in India and abroad, and serving as reviewer to national (DST, ISRO & CSIR) and international funding agencies (NASA, NSF and

UNEP) as well as to more than 25 international journals.

Prof. Satheesh has won the following Awards: Associate Award 2001 by Indian Academy of Sciences (IAS), Bangalore, India; START Young Scientist Award 2001 by START (sponsored by ESSP, IGBP, WRCP etc), International START Secretariat, USA; INSA Young Scientist Medal 2002, Indian National Science Academy, India; WMO Young Scientist Award 2002, World Meteorological Organisation, Geneva; Swarna Jayanti Fellow Award 2006, Department of Science & Technology (DST), India; Asian Young Aerosol Scientist Award 2007, Asian Aerosol Research Assembly (AARA), Japan ; SCOPUS Young Scientist Award in Earth Sciences, 2007, ELSEVIER (UK); PRL Research Award (2007) by Physical Research Laboratory (PRL), Dept. of Space, Government of India; ISBRI Fellow, Indo-Swiss Bilateral Research Initiative (ISBRI), Switzerland; NASA Senior Fellow, NASA Goddard Space Flight Center, USA and Shanti Swarup Bhatnagar Prize 2009.

Prof. Satheesh has several other recognitions to his credit such as being a Member, "Core Science Team", Indian Satellite for Aerosols and Gases, Small Satellite Program of Indian Space Research Organization (ISRO). He is also a Member, Scientific Advisory Committee (SAC) (2005-2007), Aryabhata Research Institute of Observational Sciences (ARIES), Autonomous Institute under Department of Science and Technology, Govt of India while being the Chief Mission Scientist, National Aircraft Campaign, Integrated Campaign for Aerosols, Gases and Radiation Budget (ICARB, a multi-platform, multi-institutional experiment by ISRO).

glaciers to melt faster. However, there is no evidence yet on this aspect.

Another possibility is the deposition of black carbon aerosol on glaciers leading to a decrease in the reflectance of ice which aggravates the glacier retreat. The International Commission for Snow and Ice (ICSI) has stated in their report that "Glaciers in the

Himalayas are receding faster than in any other part of the world and if the present rate continues, possibility of them disappearing by 2035 is very high". Himalayan glaciers are the headwaters for Asia's nine largest rivers, crucial for more than one billion people who live downstream. The alarming rate of increasing aerosol loading over India

coupled with a reduction of total area of Himalayan glaciers could endanger water supplies for more than a billion people. In a nutshell, urgent attention is required to reduce aerosol emissions in order to control its distressing consequences on the regional climate system. ■



Annual Conference of Indian Association for Angiosperm Taxonomy (IAAT) & International Symposium on *Angiosperm Systematics & Phylogeny: Retrospects & Prospects*

A three-day Annual Conference of Indian Association for Angiosperm Taxonomy (IAAT) and International Symposium on 'Angiosperm Systematics & Phylogeny: Retrospects & Prospects' was organized by National Botanical Research Institute (NBRI), Lucknow, in association with IAAT, Calicut, during 12-14 November 2009. About 350 delegates from universities, colleges and research institutions, mostly from India and some from abroad participated in this important event.



Top: Prof. H. Y. Mohan Ram delivering the Inaugural Address,
Above (from left): Dr Rakesh Tuli delivering Welcome Address, Dr S.K. Jain delivering the Felicitation Address, and Dr Tariq Husain proposing the Vote of Thanks

The symposium provided a unique opportunity for plant taxonomists and conservation biologists to discuss and debate on the key issues and challenges in systematic study and documentation, conservation and prospection of plant biodiversity in India and the neighbouring countries. Prof. H.Y. Mohan Ram, INSA Hon. Scientist was the Chief Guest at the Inaugural function held on 12 November 2009 at Ganna Sansthan, Dalibagh, Lucknow.

Prof. Mohan Ram, in his Address, enlightened the audience on the importance of plant species for the well being of humanity. In the backdrop of this Symposium, he mentioned that during the period of evolution of angiosperm taxonomy, three main issues

materialized; the first being the Linnaeus work, second was the publication of *The Origin of Species* and the third one is the Human Genome Project, which reflect that how closely the organisms including plant species are interrelated and interdependent on each other. He further said that biology was an exceptional branch of science in the sense that its evolutionary aspect is unique. He also dwelt upon the modern areas like application of RNA sequences for studying phylogenetic relationship. He advised to apply a balanced approach for phylogenetic studies comprising both morphological and molecular data.

Narrating the importance of herbarium, Prof. Mohan Ram said that herbarium species were the indicators

of changing climatic conditions over a period of time. He said that due to excessive exploitation and mismanagement of biodiversity, a lot of plant species have become extinct or are at the verge of extinction. Therefore, he disinclined to have an entirely market-oriented research. For the progress of science and humanity, both basic and applied researches are essential, he emphasized. He also felt the need to sensitize the policy makers for tackling the problem of biodiversity and conservation

by inducting trained experts in National Biodiversity Board. He called upon the delegates not to imitate science but make innovative attempts to ward off the challenges faced by our country.

Earlier, Dr Rakesh Tuli, Director, NBRI, while welcoming the Chief Guest and the participants said that angiosperms with high adaptability and great diversity offer immense opportunities for research. Dr Tuli further said that for understanding the evolutionary relationship among different species their stability and adaptability are fundamental to analyzing the observations and studies in some of the most competitive areas of plant science. He also briefed about the various aspects of plant research being



carried out at NBRI. Dr. Tuli elaborated upon the evaluation of biodiversity studies, taxonomic revisions, conservation biology, molecular taxonomy and barcoding being carried out at NBRI. With the depleting plant resources and growing population, there is an urgent need for classical taxonomists to take the additional responsibilities of applied systematics, he added.

Prof. M. Sabu, Secretary, IAAT, gave an overview and evolution of the IAAT. He informed that presently there are 500 members of IAAT in India, with Prof. A. P. Das as the President of the Association. One of the main aims of IAAT is to promote angiosperm taxonomy in India while providing common forum for this specialized branch of Plant Sciences.

Dr S. K. Jain, INSA Hon. Scientist and former Director of BSI, India, in his felicitation address said that the presence of such a huge gathering of taxonomists was a testimony in itself of the progress of angiosperm taxonomy in the country. He said that taxonomical studies have helped to decipher our natural resources. The information gathered on various plant species and the established herbarium in the country are valuable source for unfolding the species susceptible to the changing environment owing to climate change. Prof. A. P. Das, felt proud of the growth of the IAAT which helped in disseminating the taxonomical work in the country. On this occasion, the taxonomic and biodiversity databases on lower and higher plants christened as 'PADAP' and NBRI-LWG-virtual herbarium developed by NBRI were launched by Prof. Mohan Ram.

The first day started with two Medal Award Lectures by Dr. T. S. Nayar (Y. D. Tiagi Medal Award) and Dr. D. Narshimhan (V.V. Shivarajan Medal Award). The session of the Conference and Symposium was started with two lead lectures by Prof. S. N. Raina, Retd. Prof., Delhi University, and Prof. Magnus Liden, Uppsala University Botanic Gardens, Uppsala, Sweden. Three parallel sessions were held on *Biodiversity* along with poster session on the same theme. During this session, 46 oral presentations and 54 posters were presented.

The second day started with lead lectures by Prof. Magnus Liden on *Fumariaceae*, Prof. S. R. Yadav, Shivaji University, Kolhapur on *Conservation Aspects*, Prof. David Leonardo Dilchar, Florida Field Museum of Natural History, USA, on *Major Steps in Angiosperm Evolution* and Prof. Wazahat Husain,

Aligarh Muslim University, Aligarh, on *Biodiversity Conservation*.

The sessions started with competition presentations for the six awards. The presentations for K. S. Manilal Award, T. R. Sahu Award, Rolla S. Rao Award were held parallelly in different halls. The poster presentations for S. R. Yadav Award was also held simultaneously.

The afternoon sessions started with Fr. Anthony Mukkut K.S Manilal Award presentations in one hall and in other two halls session II on *Bioprospection* and session III on *Phytogeography, Endemism, Conservation, Phytodiversity and Response to Climate Change* were held in parallel. For *Bioprospection* 20 oral papers were presented and for *Phytogeography, Endemism, etc.*, 17 oral papers were presented. Fortynine posters were presented in the *Bioprospection* session.



Visitors at one of the poster sessions



On third day, lead lectures were given by Prof. T.R. Sahu, Dr H. S. Gaur, Sagar University, on *Indigenous Knowledge of Biological recourses*; Prof. A.K. Pandey, Delhi University, on the *Changing Concepts of Compositae Systematics* and Prof. M. K. Janarthanam, Goa University, on *Endemic Plants and Climate Change*.

Dr A. K. Goel, Secretary, Outstation, IAAT, welcomed the delegates during the valedictory function. The awards were distributed to the awardees for different categories. Valedictory Address was given by Dr S. K. Jain, and Presidential Address by Prof. A.P. Das. Prof. G. H. Dar, Head, Department of Botany, Kashmir University, gave his views regarding the event. Prof. M. K. Janarthanam read the recommendations made by IAAT.

Dr. Tariq Husain, Organising Secretary of IAAT Conference and International Symposium proposed the Vote of Thanks.

Following recommendations emerged after intensive discussion and deliberations among the experts and participants:

- Inventorying of plant diversity has been recognized as an important task ahead of plant taxonomists of the country. To achieve this, training of manpower through targeted workshops for providing necessary skills and mobilizing required support are basic necessities. Formulation of appropriate policies, coordinated programmes and financial assistance from various funding agencies towards implementing these have been recommended.
- The information generated by the

taxonomists should reach all the stakeholders including the public. To facilitate this it has been envisaged to digitize all the information already available and make it accessible to the public. In this regard, NBRI has already made efforts and launched two plant databases, namely PADAP (www.nbri.res.in/padap) and LWG-virtual herbarium (www.nbri.res.in/herbarium). Software developed by NBRI may be made available to interested groups and NBRI may organize workshops to train researchers in developing digitized plant databases.

- Group specific revisionary and monographic studies supported with molecular approaches have been identified as major thrust areas for understanding the diversity within and among the species of different plant groups across various geographical and climatological regimes of the country.
- Plant systematic studies have been recognized as essential requisite for identifying useful traits and genes so that they can be used in various breeding and biotechnological applications in agriculture, health, environment, energy, etc.
- Intensive studies for assessing and monitoring of endemic and rare, endangered and threatened (RET) plant species have been recognized as one of the most urgent tasks requiring attention of plant taxonomists, policy makers and funding agencies.
- Coordinated long-term programmes involving taxonomists,

environmentalists, climatologists, paleontologists, and ecologists need to be developed for assessing the impact of climate change on plant species and ecosystems and for formulating appropriate mitigation measures. The important role played by taxonomists and taxonomic data in understanding climate change and plant responses is crucial in this context.

- NBRI expressed willingness to accept herbarium specimens for deposit in LWG. For those Institutions or individuals who do not have adequate resources to process herbarium specimens, NBRI offers to extend training and facilities for them and they are encouraged to deposit one set of specimens in NBRI Herbarium (LWG).
- NBRI offers to organize training workshops in molecular techniques/ molecular systematics at the Institute for interested groups and institutions.
- Networking and exchange of live plants among institutions and experts to be promoted to enrich plant repositories such as botanic gardens, arboreta, gene banks, etc.
- IAAT website may be upgraded with information of and possible e-links with major institutions with taxonomic expertise and the programmes and resources available at these institutes. This may foster developing networks of interested institutions and developing coordinated research projects in important thematic areas in taxonomy and related disciplines.



Joint International Convention (JIC) of 8th IAHS Scientific Assembly and 37th IAH Congress

The National Geophysical Research Institute (NGRI), Hyderabad, along with the Association of Hydrologists of India (AHI) hosted the Joint International Convention (JIC) of 8th Scientific Assembly of the International Association of Hydrological Sciences (IAHS) and 37th Congress of the International Association of Hydrogeologists (IAH) at Hyderabad International Convention Centre (HICC) during 6-12 September 2009. The focal theme of the JIC was, *Water: A Vital Resource Under Stress: How Science Can Help*.

The Seminar was inaugurated by Smt Daggubati Purandeswari, Hon'ble Minister of State of Human Resource Development (Higher Education), Government of India and was presided over by Dr V. P. Dimri, Director, NGRI. Dr Arthur Askew, President of IAHS and Dr Willi Struckmeier, President of IAH addressed the delegates after releasing five volumes of prepublished seminar proceedings in the form of IAHS red books. Prof. Pierre Hubert and Dr Shaminder Puri, the Secretary General's of IAHS and IAH, respectively, presented reports on the worldwide activities of their Associations.

Smt Purandeswari, in her Inaugural Address dwelt on the need for proper management of water resources, both



Seen on the dais (from left) are: Dr. S. N. Rai, Dr. Shaminder Puri, Dr. Willi Struckmeier, Dr. V. P. Dimri, Smt. Daggubati Purandeswari, Dr. Arthur Askew, Prof. Pierre Hubert and Prof. P. Rajendra Prasad

surface and ground water, which are unevenly distributed in time and space domains. She touched upon the water quality problems that are being faced worldwide and more so in developing countries. She made special reference to the issue of water pricing and stressed the need for the protection of basic right for the availability of quality water to all the habitants.

In her concluding remarks she hoped that the international community together with the national hydrological experts would be able to work out amicable solutions to the persisting global water problems in general as well as regional and local problems in particular. Dr S. N. Rai, Vice President of IAH and Convener of JIC highlighted the significance of JIC in Indian context and proposed the Vote of Thanks to all the key persons responsible for the organization of the Seminar.

Inaugural Function was followed by

an Inaugural Lecture by Prof. Ghislan de Marsily, Emeritus Professor, University of Paris VI, France on, 'Freshwater Stocks on Earth as Ice, Surface Water, Ground Water: Are We Losing Water?' This special function was presided over by Prof. V. V. J. Sharma, President of the Association of Hydrologists of India. Prof. P. Rajendra Prasad, another Convener of JIC and

Vice President of IAHS proposed the Vote of Thanks.

There was a special lecture delivered by Prof. Stephen Foster, World Bank, GW-MATE Director and IAH Past President on, 'Hard-Rock Aquifers in Tropical Regions – Using Science to Inform Development and Management.' On this occasion Mr Popatrao Pawar, the Chief of Village Council of Hivre Bazar, a small village in drought-prone area of Maharashtra, was presented "IAH Distinguished Award" by Dr Willi Struckmeier for his community-based water resources management schemes, which have brought an all-round progress in his village. Dr Struckmeier presented the IAH President Award to Dr Peter Dhillon and Honorary Membership to Prof. Jiri Krasny.

JIC was structured into 22 symposia dealing with almost all topics of hydrological sciences such as



ecohydrology, hydroinformatics, ground water sustainability in highly stressed aquifers, integrated water resources management, interaction between surface and ground water, transboundary water management, isotope hydrology, high mount snow and ice hydrology, sediment management in Asian river, flood risk management, prediction in ungauged

basins, precipitation variability and water resources, new statistics in hydrology, Ground water development and management in hard rock region, ground water pollution, socio-economic issues relevant to ground water etc.

A field tour to the *Himayat sagar* and *Osman sagar* was organized in the forenoon of 9th September. A Workshop on '*Managed Aquifer Recharge*'

(MAR) was organized on September 10. More than 510 delegates from 62 countries attended the Joint Convention and presented more than 680 research papers as oral or poster presentations. JIC was concluded with a well attended Valedictory Function on 11th September which was presided over by Prof H. K. Gupta, Vice President, IUGG.

Seminar-cum-Workshop on Gas Phase Mass Spectrometry

A one-day Seminar-cum-Workshop on 'Gas Phase Mass Spectrometry (GC-MS)' was held at North East Institute of Science & Technology, (NEIST), Jorhat, on 13 November 2009. The Workshop was sponsored by Thermo Fisher Scientific Pvt. Ltd, Mumbai, a brand service provider company. Dr R. C. Baruah, Director In-charge, NEIST presided over the Inaugural Function of the Workshop. Dr M. Hazarika, Director, TRA, Tocklai, was the Chief Guest.

A total of 64 participants from different institutes and universities of North-East Region namely Guwahati University, Tezpur University, Assam Agriculture University, Central Muga Eri Research & Training Institute, Jorhat; National Research Institute on Mithun, Nagaland; Numaligarh Refinery Ltd, Numaligarh; etc. attended the workshop, besides the NEIST scientific community. Shri A. K. Hazarika, Scientist & Head, Analytical Chemistry Division of NEIST and Seminar Coordinator while delivering the Welcome Address said that GC-MS is the most powerful tool in Analytical Chemistry work and the objective of the Seminar was to enhance the techniques more deeply.

Shri Ajay Kar, Regional Sales Head, Thermo Fisher Scientific Pvt. Ltd, apprised of the purpose behind the Seminar and said that the Seminar is meant to be a platform for the exchange of ideas and views. Understanding the nature of problems in day to day analysis can actually help in improving the status of the tool, he said. He also spoke about the company which provides recent and latest analytical tools to the developing industries.

Delivering his address, Dr M. Hazarika, expressed his happiness to be associated with the Workshop and suggested that GC-MS analysis should keep pace with the changing and latest developments. The technique was initially introduced in the early 20th century to unravel the unknown facts and the developments in chemical science which have gone a long way in different areas of research, he said. He further encouraged the participating candidates to inculcate the nature of quest for more knowledge so as to keep themselves abreast with the changing environment and in choosing the right equipment for their research work. He also appreciated the organizing committee for holding such a seminar which was first in its case and wished the programme a grand success.

Dr Baruah, apprised of the need and importance of mass spectra in identifying the structure of any unknown compound and said that there is no research without GC-MS. The function concluded with the Vote of Thanks by Shri Manas Bera, Area Service Manager, Thermo Fisher Scientific.

The Technical Session of the Workshop covered fundamentals of GC-MS, its applications, introduction of India's first Indigenous GC-MS and Hands on experiment on GC-MS. Dr Swapan Kr. Dutta, Joint Director, Directorate of Forensic Science, Assam, delivered the technical lecture on, 'GC-MS applications'. It is hoped that the Workshop would bring the awareness among the end users about the perfect choice and rightful selection of these expensive and important analytical tools vis-à-vis the service provider of such tools.



Indo-US Workshop on Nanotechnology:

Applications & Implications

Indo-US Workshop on *Nanotechnology: Applications & Implications* was organized by the Indian Institute of Chemical Technology, Hyderabad, during 10-12 November 2009. It was co-sponsored by Asian office of Aerospace Research and Development, Japan, Tuskegee University, USA and the Indian Nanoscience Society, India. About 175 students, academicians and researchers attended the Workshop, which comprised three sessions with 23 invited lectures, 43 oral and 23 poster presentations.

The Workshop was inaugurated by Prof. N. K. Ganguly, a distinguished Biotechnology Fellow; Advisor, Translation Health Science &

Technology (THSTI), New Delhi, and former Director General, ICMR who said that useful applications of nanotechnology have been proved in animal Studies though much was required before this technology becomes useful in human healthcare. This technology finds numerous applications in various branches of biosciences, engineering and technology as well. Prof. Ganguly also emphasized on the importance of safety and toxicity assessment of nanomaterials before being used for human health. Director, IICT, who presided over the function, said that the applications of nanotechnology were facing a big challenge in the form of toxicity testing. Evaluation

of the full impact of miniature quantities of nano materials on the human body was a big challenge for the scientists in this field.

The three-day Workshop brought biologists, chemists, physical scientists and engineers on a single platform to discuss nanomaterial synthesis, nanomaterial characterization, nanomaterial devices, electronic and composites nanomaterial applications/uses and nanomaterial toxicology. Informative presentations followed by discussions proved to be very useful for the young scholars and provided a platform to the researchers for mutual interaction and exchange of knowledge on various aspects of this specialized discipline.

NAL Celebrates its Foundation Day

The National Aerospace Laboratories (NAL), Bangalore, celebrated its Foundation Day on 14 November 2009. This was a three times memorable day for NAL as it marked three major events – NAL Foundation Day, Curtains down for the year long Golden Jubilee Celebrations and Inauguration of the splendid golden jubilee Aircraft Hangar at NAL, Belur campus. Shri Prithviraj Chavan, Hon'ble Minister of State (Independent Charge) for Science & Technology and Earth Sciences, and Vice President, CSIR, was the Chief Guest on the occasion. The other dignitaries present on the occasion were: Dr. G. Madhavan Nair, Vikram Sarabhai, Distinguished Professor, Chairman,

Research Council, NAL and the then Chairman, ISRO and Secretary, DOS, Dr. A. R. Upadhyaya, Director, NAL, Dr. Nayak, Adviser(M&A), Mr. Chidananda, Head, CCADD and Dr. Ranjan Moodithaya, Head, ATF & KTMD.

Shri. Prithviraj Chavan, in his Address, congratulated NAL on being a front-ranking member of the CSIR family, and on its five decades of dedicated service to the nation in the advanced and strategic area of aerospace. He lauded the efforts of NAL in setting up state of art, world class wind tunnels and other testing facilities, and contributions to nation's S&T, civil, military and space programmes. Full preparedness with

indigenous technologies was the only way to overcome technology denials, which generally come at crucial times, he cautioned. The strength from knowledge and innovation could propel India to be a major economic and technological power, – the India of Nehru's dreams. S&T innovations, as declared by the Hon'ble President of India Mrs. Prathibha Patil, should touch the lives of a million common Indians and help better their quality of life. Shri. Prithviraj Chavan, also released the NAL Annual Report for the year 2008-09.

Dr Madhavan Nair, in his address, commended NAL's S&T contributions, and the timely support given by NAL to most of the space programmes,



company in India to develop defense electronic equipments and special purpose computers. He said that it was indeed a matter of pride that the Hon'ble Minister had chosen NAL as one of the first CSIR labs to visit after he took over as the Minister of

especially the aerodynamic configuration testing of the Chandrayan prior to its launch. He wished CSIR-NAL a bright future.

Speaking on the occasion, Mr. Chidananda gave an overview of NAL's civil aviation programme and the background to the modern aircraft hangar which will accommodate three SARAS class aircraft. After the unfortunate accident to SARAS PT- II, efforts are on to speedily complete the third prototype with decreased weight using composite wing and empennage, he informed. The hangar is proposed to be used to produce the first two aircrafts of the initial 15 required by the IAF as part and production by HAL. He also mentioned that the Indian Postal Department has shown interest in using SARAS for light cargo and courier service across India. It was also encouraging to note the progress in the first Public-Private partnership with Mahindra for the production of NM-5, a 5-seat General Aviation Aircraft, he expressed.

Speaking regarding the celebrations during Golden Jubilee year, Dr. M. R. Nayak informed the August gathering, that two international conferences, three international workshops, 17 national events including seminars in Hindi and Kannada and the first ever SC-ST conference in the country were held.

Open days and aerofests were conducted to create awareness in students which included mobile exhibitions, workshops, aeroquiz and glider flying to name a few. He further said that this day was also marked by the inauguration of the classic supersonic test section in the existing 0.6 m wind tunnel to enhance the aerodynamic testing capability from transonic to supersonic Mach numbers upto 4.0 at NTAF, NAL, Bangalore. NTAF and L&T, Mumbai, have executed the project funded by the CSIR, ISRO and DRDO. The Variable Mach Number Flexible Nozzle (VMFN) was designed and developed by L&T, Mumbai, according to the specifications of NTAF. For the first time in India, a VMFN which allows continuous *on-line* change of Mach number from Mach 1 to 4 has been designed, manufactured, installed and commissioned. The first supersonic blow down was inaugurated by the Hon'ble Minister in the presence of Dr. G. Madhavan Nair and Dr. A.R. Upadhyia.

Earlier, Dr. Upadhyia, in his Welcome Address, introduced the Chief Guest, Shri. Prithviraj Chavan, who is an alumni of BITS, Pilani and holds a Masters degree in engineering from the University of California, Berkeley, and is presently a Visiting Professor at BITS and Founder of a

State (IC) for Science and Technology. Completing 50 years of fruitful and meaningful existence was a great milestone in the road map of any Institution, he expressed. This was made possible by the vision of the first Director of NAL, Late Dr. P. Nilakantan and the planning and hard work of all the subsequent Directors of NAL. The coincidence of this eventful day with the birthday of Late Prime Minister Pandit Jawahar Lal Nehru was a tribute to his dream of an S&T led India which led to the establishment of several R&D labs in different areas of science, including CSIR.

On the occasion, the achievements of the scientists of NAL during 2008-09 were acknowledged by way of awards such as NAL Technology Shield for Outstanding Group Achievement, Best Woman Scientist, Excellence in Research, Excellence in Design, Development and Project Execution and a one-time Special Award for Disseminating the Technologies of NAL to common man through Media and Publicity. Awards were also distributed to the children of employees for excellence in academics, sports and extra / co-curricular activities.

The Vote of Thanks was proposed by Dr. Ranjan Moodithaya, Head ATF and KTMD.



NGRI Celebrates the Foundation Day

The National Geophysical Research Institute (NGRI), Hyderabad, celebrated its Foundation Day on 12 October 2009. Dr Naresh C. Mehrotra, Director, Birbal Sahni Institute of Palaeobotany, Lucknow, who was the Chief Guest on the occasion delivered a talk on 'High Impact Micropalaeobotany in Hydrocarbon Exploration in Indian Petroliferous Basins'. Dr Mehrotra, in his talk, highlighted the significance of

micro fossils in appreciating sequence stratigraphy, sedimentation patterns, depositional characteristics and tectonics of different petroliferous basins of India focusing on the relevance of micropaleontology in petroleum exploration.

Earlier, Dr V.P. Dimri, Director, NGRI, gave a presentation highlighting the achievements of the Institute during the recent past. Dr Dipankar Sarkar, Scientist, NGRI, introduced the Chief

Guest to the distinguished gathering. The Annual Report 2008-09 was released and mementos were distributed to the employees who had successfully completed 25 years of service at NGRI. Prizes were awarded to the winners of Quiz competition, which was conducted for staff members including project assistants.

Dr T.R.K. Chetty, Scientist, NGRI, proposed a Vote of Thanks.

NEIST Celebrates CSIR Foundation Day

The North East Institute of Science & Technology (NEIST), Jorhat, celebrated CSIR Foundation Day on 12 October 2009, this year, due to Puja Holidays, unlike every year when it is celebrated on 26 September. The Foundation Day celebration function was held at NEIST auditorium. Dr. P. G. Rao, Director, NEIST, Prof. G. D. Sharma, Pro-vice Chancellor, Assam University, Silchar, was the Chief Guest at the function.

Dr. P. C. Neog, Scientist, NEIST, while welcoming the distinguished audience and guests said that CSIR, a centre of excellence in research is one of the world's largest public funded organizations with strong global academic and research linkages

The Chief Guest, Dr Sharma, in his Address, said that we are preparing ourselves to compete and become a part of the global scientific community. The North East India is unique, significant and holds a strategic position in our nation with security as the topmost priority.

Talking about CSIR-NEIST, he said that the Institute has become visible in the last five years and has played a major

role in the socio-economic development of the hilly states of NE. He further said that the scientific community needs to develop professionalism by which he meant the ability or the capacity to continuously work without supervision and to complete the task assigned or taken up by oneself. To complete the task, clarity of the task and integrity are essential, he said. Though India is having the second largest pool of the scientists but when compared to the nation's population, it is insignificant. Instead of one scientist per 100 people which is the requirement of the day, at present, we have one scientist per 1000 people. He apprised that NEIST is the only organization which has been identified by Department of Science & Technology, New Delhi, to undertake 60 undergraduate colleges under its wing to oversee their development with the aim to develop scientific human resources. He informed that 54% of Indian population is young, all we need is to create such environment and attitude that they will tend to innovate and develop need based technology for

the society's benefit. This can be achieved by pooling our resources together and multi-institutional collaboration.

Dr. Rao, in his Address thanked Prof. Sharma for giving direction to the Institute and showing the right path for future. He said the CSIR is a premier organization which had made significant contribution in various fields like baby food, drug development, transport, aircraft development etc., but has remained behind the screen for so long because other organizations got wider publicity than itself. He concluded by saying that we should pool our strengths, focus on research and take up mega projects.

The Chief Guest and the Director, NEIST, also released some publications. These included Hindi version of the *NEIST News*, a bimonthly newsletter of the Institute, and a brochure highlighting the activities and achievements of the Institute published for the first time in the laboratory. Other publication included English and Assamese version of a brochure entitled, '*Hazards-Minimizing Risk, Maximizing Awareness*'. Dr L. Nath, Scientist, NEIST, proposed a Vote of Thanks.

NBRI Organizes Chrysanthemum and Coleus Show

The National Botanical Research Institute, Lucknow, organized the Annual Chrysanthemum and Coleus show on 6-7 December 2009. The main objective to organize the flower show is to promote floriculture industry and to develop awareness about the floriculture. The show provided an opportunity to public to develop interest and knowledge on the cultivation practices of chrysanthemum and coleus and to witness the entire diversity of flower colours, types, shapes. A total of 123 exhibitors from Lucknow and outside, with 903 entries participated in the show.

NBRI is maintaining more than 250 germplasm collections of chrysanthemum comprising almost all colours and types. The various R&D activities on chrysanthemum and coleus undertaken by NBRI were explained to the visitors. New varieties developed through different traditional and modern methods were displayed. Public got a unique opportunity to interact with scientists of NBRI working on chrysanthemum and got the first hand information to generate knowledge on agro-technology, techno-economics, commercial cut flower varieties and many other cultivation practices.

The show was organized at the Central Lawn of the Institute, amidst the swing blooms of vast array of chrysanthemum and splendid varieties of coleus with scattering colour and joy in the atmosphere. The fresh and dainty coleus displayed multi-coloured foliage. Besides this, cut flowers and special flower arrangements were also organized in a huge enclosure. The panoramic sight of different varieties of flowers elated the visitors comprising every age group.



His Excellency Shri B.L. Joshi, Governor of U.P. addressing the public

A total of 311 (107 First, 90 Second and 114 Commendation) prizes in addition to 23 running challenge cups, shields and trophies were awarded to the successful competitors. On this occasion, His Excellency Shri B.L. Joshi, Governor of U.P, who was the Chief Guest distributed the prizes/shields/cups to the winners.

This year entries received from Assistant Engineer, U.P. Power Corporation Ltd, Ashok Marg, Lucknow, won a maximum of five trophies/running challenge cup, shields viz. Nabi Mohd. Running Challenge Cup for the highest score in specimen pots of chrysanthemum in Class-A (A-1 to A-3), M.Y. Khan Running Challenge Trophy for the highest score in chrysanthemum cut-flowers in Class-A (A-7 to A-9), Mehboob Ali Memorial Running Challenge Trophy in Class-E, Section E-8 for a collection of six pots of different varieties of incurved type large flowered



His Excellency Shri B.L. Joshi, Governor of U.P. being taken round the show by Dr. Rakesh Tuli, Director, NBRI, and being explained about the Gerbera cultivation at NBRI



FLOWER SHOWS



Prize winning entries: Queen of the show, Flower of the year, King of the show and Prince of the show



A view of the chrysanthemum and coleus show



Mini varieties of chrysanthemum developed by NBRI displayed in the flower show

chrysanthemum, Devi Shankar Sinha Memorial Running Challenge Trophy for the best artistic group of large flowered chrysanthemum in Class G-1 and Vikramajit Singh Running Cup for the Highest Score in the Show.

Shri Uma Shankar Sahu of Gomti Nagar, Lucknow, secured the second position by winning four trophies/cups/shields viz. Mohammad Mullick Memorial Running Challenge Trophy in Class-C, Section C-2 for six pots of six different varieties of large flowered chrysanthemum, Quazi Syed Masood Hasan Running Challenge Trophy for 'Prince of the Show' for a specimen pot of spider bearing single bloom in Section E-4, Smt. Krishna Devi Memorial Running Trophy for a collection of four pots of different varieties of Spider type large flowered chrysanthemum in Section E-7 and Syed Shaheer Hasan Memorial Running Challenge Cup for the best specimen pot of a reflex type large flowered chrysanthemum in Section E-9.

Headquarter, Central Command, Lucknow, bagged the third position by winning three trophies/cups/shield viz. Indian Explosives Ltd, (Fertilizer Division) Running Trophy for the highest score in the specimen pots of chrysanthemum (D-1 to D-24), Percy-Lancaster Challenge Cup for a collection of nine pots of different varieties of Korean type chrysanthemum in Section E-1 and Smt. Madhuri Rai Challenge Shield for a set of two specimen pots of chrysanthemum large and small flowered type trained in one each of attractive styles in Section E-5.

Shri Ashok Kumar Singh, DRM, North Eastern Railway, Lucknow, won two trophies viz. Shri Govind Prasad Memorial Challenge Trophy in Class C-4 for 12 pots of 12 different varieties of small flowered chrysanthemum and Smt. Ranjit Singh Memorial Trophy for 'Queen of the Show' in Section E-3. Lt. General J.K. Mohanty, Kasturiba Marg, Lucknow, lifted the G.O.C-in-C. Central Command Running



Challenge Cup for the highest score in specimen coleus plants (D-42 to D-50) and Smt. Kumud Rastogi Memorial Running Challenge Trophy for the best specimen coleus pot plant of the Show in Class E, Section E-10. Shri S.K. Sharma, Seiko Cables of India, Aishbagh, Lucknow, lifted the Ranjit Singh Memorial Trophy for 'King of the Show' in Section E-2 and Ram Kishore Sharma Memorial Trophy for the 'Flower of the year – Pink Clout' for a specimen pot of large flowered chrysanthemum with single plant bearing single bloom in Section E-6.

Director, Central Institute of Medicinal and Aromatic Plants, Lucknow, was recipient of two Running trophies/Cups i.e. Mahfooz Ali Memorial Running Challenge Trophy for the best artistic group of small flowered chrysanthemum in Class G-2 and R. V. Sitholey Memorial Running Challenge Cup for the best artistic group of coleus in Class G-3. Shri Sashank, Aliganj, Lucknow, bagged the Savitri Devi Memorial Challenge Trophy in Class C-1 for 12 pots of different varieties of large flowered chrysanthemum,

Hindalco Industries Ltd, Ranukoot, Sonabhadra, Uttar Pradesh, bagged the Begum Saeeda Khatoon Running Challenge Trophy in Class-D (D-25 to D-31) for the highest score in cut blooms in large flowered chrysanthemum and Shri Dinesh Chandra Mishra of Husainganj, Lucknow, was successful in lifting the Qazi Syed Hasan Memorial Running Challenge Trophy for the highest score in Class-F Coloured photographs of chrysanthemum.

Besides the above winners, Assistant Engineer, U.P. Power Corporation Ltd, Ashok Marg, Lucknow, bagged the first place by winning a total of 30 prizes (14 First, 7 Second and 9 Consolation), Headquarter, Central Command, Lucknow, occupied the second position by winning a total of 18 prizes (5 First, 7 Second and 6 Consolation) and Superintendent, Rajkiya Udyan, Alambagh, Lucknow, secured the third position by winning a total of 16 prizes (6 First, 4 Second and 6 Consolation).

His Excellency Shri B. L. Joshi, Governor of Uttar Pradesh, who was the Chief Guest on the occasion, in his

address, said that beauty of flowers has captivated people of all classes and generations. They are being used in various stages of life from cradle to grave. Flowers emit fragrance and make others happy. This signifies a message for human beings to selflessly devote the life for the happiness of others. He said that flowers were symbolic and the beauty of flowers has found expression in many songs and literature. He appreciated the efforts of NBRI scientists in bringing life to flowers in the form of releasing lot of varieties for the benefit of public.

Earlier, Dr. Rakesh Tuli, Director, NBRI, while welcoming the Chief Guest, invited dignitaries and general public, said that significance of holding flower shows was not only popularizing floriculture but to demonstrate the R&D efforts made by NBRI in developing novel varieties. The contribution of India in global trade of floriculture is very insignificant. He urged the necessity of developing novel flower varieties that have demand in international market and contribute to global commerce in floriculture.

King of the Show (Ranjit Singh Memorial Trophy)	Shri S.K. Sharma, SEIKO Cables of India, Aish Bagh, Lucknow
Queen of the show (Smt Ranjit Singh Memorial Trophy)	Shri Ashok Kumar Singh, DRM, North Eastern Railway, Luckno
Prince of the show (Quazi Syed Masood Hasan Running Challenge Trophy)	Shri Uma Shankar Sahu, Gomti Nagar, Lucknow
Flower of the year (Ram Kishore Sharma Memorial Trophy)	Shri S.K. Sharma, SEIKO Cables of India, Aish Bagh, Lucknow
Best Specimen Coleus (Smt. Kumud Rastogi Memorial Running Challenge Trophy)	Lt. Gen. J.K. Mohanty, GOC in C, Central Command, Lucknow
Syed Saheer Hasan Memorial Running Challenge Trophy	Shri Uma Shankar Sahu, Gomti Nagar, Lucknow



Shri Prithviraj Chavan, visits C-MMACS and IFCAP

Shri Prithviraj Chavan, Hon'ble Minister for Science & Technology and Earth Sciences (Independent Charge), Government of India, and Vice President, CSIR, visited CSIR Centre for Mathematical Modelling & Computer Simulation (C-MMACS), Bangalore, and Integrated Facility for Carbon Fiber and Prepregs (IFCAP) on 14 November 2009.

To provide a quick but comprehensive view of the major research activities at C-MMACS, a poster display of about 30 posters was organized. These posters highlighted the main research programmes, major projects and significant results of C-MMACS research. In terms of specific results, the Hon'ble Minister was apprised of the multi-institutional project on climate modelling with focus on integrated analysis for impact, mitigation

and sustainability, geo-hazard modelling, CO₂ flux and industrial flow; the structure and power of C-MMACS computing platform and research related to network security were also highlighted. The Hon'ble Minister was also briefed on the significant on-going efforts to develop a mathematical modelling enabled CSIR through networking of CSIR laboratories through C-MMACS.

Shri Chavan also addressed the scientists and the staff of C-MMACS, and expressed his appreciation of the spectrum and depth of research carried out at C-MMACS. He emphasized the criticality of research on climate change, and especially climate modelling, and expressed his satisfaction at the comprehensive effort by C-MMACS in this area; he called for a concerted and critical effort combining modelling

observation and analysis to enable India to face the challenge of climate change through reliable and quantitative regional analysis and modelling. He also emphasized the need to keep applications of research results in focus, and suggested exploration of productization of the findings. The Hon'ble Minister in his concluding remark congratulated the C-MMACS scientists for employing the growing power of High Performance Computing to real-world applications.

The Hon'ble Minister also visited the Integrated Facility for Carbon Fiber and Prepregs (IFCAP) and showed keen interest in the carbon fibres, acrylic fibres and polymers developed in the facility. He was briefed about the technical know-how transfer of carbon Fibre technology to M/s Kemrock Industries of Baroda.

A Befitting Honour to Dr. B. D. Kulkarni on his 60th birthday

Industrial & Engineering Chemistry Research, a peer-reviewed semi-monthly scientific journal published by the American Chemical Society has brought out Issue No. 21, Volume 48 dated November 4, 2009 as a Festschrift to recognize and honour Dr. B. D. Kulkarni's contributions to Chemical Engineering Science.

This is indeed a great honour to National Chemical Laboratory (NCL), Pune, in particular, and CSIR in general. B. D. (as he is called affectionately) is an erudite scholar whose accomplishments have received global acclaim. The fact that his entire career has been spent at NCL / CSIR is a testimony to the fact that NCL and CSIR nurture and sustain exceptional talent, where, the best minds can work and grow without inhibitions or road blocks.

Dr. Kulkarni joined as a senior research fellow of CSIR at NCL in 1973 after completing his Bachelors and Masters in chemical engineering in 1970 and 1973, respectively from Laxminarayan Institute of Technology, Nagpur. He received his doctoral degree under the supervision of Dr. LK Doraiswamy in 1978 at NCL and joined as Scientist in September, 1979.

Dr. Kulkarni's contribution to chemical engineering has resulted in over 270 invited and research papers in peer-reviewed journals, 7 books and 21 national / international patents. He has mentored the PhD thesis of over 65 students.

The problems that B.D. has handled over the years have embraced all levels - macroscopic, mesoscopic, and





microscopic - as well as artificial intelligence (AI)-based evolutionary formalisms. Some of these models have broken new ground and have led to considerably improved fundamental understanding of the reacting/reactor systems. More specifically, his application of nonlinear systems dynamics theory to reactor/ reacting systems has revealed several insights on bifurcation and stability characteristics, leading to novel design and control.

His work has led to the evolution of many novel concepts which include:

- A new rate law model called “Encillator”, which is a model reaction system involving exponential autocatalysis to explain variety of reaction behavior;
- An arithmetic-analytical approach to solutions of model equations, which is a novel approach that combines the elegance of analytical solutions

and rigor of digital computations;

- Rigorous fluidized-bed reactor model using initial value formalism;
- Multiplicity, instability, and bifurcation behavior of chemical reactions and reactors using normal form theory;
- Optimization and control of unknown systems (ANNs and evolutionary algorithms);
- New techniques of model building from measured data, including surrogate analysis, phase space reconstruction, wavelets, proper orthogonal decomposition, and stochastic estimation;
- Soft sensors developed using AI tools are commercially exploited by large polymer industries;
- Cleaning and separation of measured signal without any *a priori* information;
- Formulation of exact or near-exact

functional form from measured data; and

- Microemulsions (synthesis of nanoparticles, electrochemical reactions, organic biotransformation, etc.).

Dr. Kulkarni is recipient of the prestigious Shanti Swarup Bhatnagar Prize for Engineering Sciences & Technology. He is an elected Fellow of all the academies of science and engineering in India, namely, Indian National Science Academy, New Delhi, Indian Academy of Sciences, Bangalore, National Academy of Sciences, Allahabad, Indian National Academy of Engineering, New Delhi. He is also an elected Fellow of the Third World Academy of Sciences, Trieste, Italy. He is even the recipient of J.C. Bose Fellowship of the Department of Science and Technology, Government of India.

INSA Medal for Young Scientists (2009)

INSA Medal for Young Scientists Award, considered to be the highest recognition of promise, creativity and excellence in a young scientist, carries a medal, a certificate and a cash prize of Rs 25000/-. In the year 2009, 28 young research workers were honoured with INSA Medal for Young Scientists that comprised the following four scientists from CSIR.

- Dr Rajesh Ghanshyam Gonnade (b.21.03.1974), PhD, Scientist C, Centre for Materials Characterization, National Chemical Laboratory, Dr Homi Bhabha Road, Pune.

For his wide-ranging studies on halogen bonding and crystal engineering of inositols.

- Dr Amol Arvindrao Kulkarni (b.03.12.1976), PhD, Scientist, Chemical Engineering Division, National Chemical Laboratory, Dr Homi Bhabha Road, Pune.

For Designing of microreactors for continuous flow synthesis and microdevices for carrying out exothermic reactions.

- Dr Beena R. Pillai (b.09.12.1974), PhD, Scientist, Comparative Genomics and Gene Expression,

Institute of Genomics and Integrative Biology, CSIR, Delhi.

For insightful work on neuro degenerative disorders.

Dr K.V. Ramesh (b.12.07.1975), PhD, Scientist, CSIR Centre for Mathematical Modelling and Computer Simulation, Bangalore.

For his significant contributions in understanding air-sea interactions on intraseasonal time scale over the Indian monsoon region using global general circulation model and new oceanic data.



Prof. Ramesh Chandra Budhani Takes Over as Director, NPL

Prof. Ramesh Chandra Budhani has taken over as Director of National Physical Laboratory (NPL), New Delhi, w.e.f 11 December 2009.

Prof. Budhani is an experimental condensed matter physicist with research interests in superconductivity and magnetism in a broad class of materials including thin epitaxial films and heterostructures, self-assembled and patterned nanostructures, and other low dimensional systems.

Prof. Budhani received his Master's degree in Physics from the Allahabad University in 1976 and Ph D in Condensed Matter Physics from the Indian Institute of Technology (IIT), Delhi. He has been a Research Scientist at the University of California - Los Angeles during 1983-1987, a Staff

Scientist at the Brookhaven National Laboratory, New York from 1988 to 1994 and a Professor at the Department of Physics, Indian Institute of Technology, Kanpur, during 1994-2009. He has been a Visiting Professor at the Center for Superconductivity Research University of Maryland, a Guest Scientist at CRISMAT Laboratory, Caen, France and Brookhaven Lab, and Joliot Fellow of the Laboratoire de Physique du Solide, ESPCI, Paris, France.

Prof Budhani has published about 150 papers in high impact factor journals such as *Science*, *Physical Review*



Letters, *Applied Physics Letters*, *Physical review B* etc., many of which are extensively cited. Prof. Budhani has been invited to deliver talks on his research at several universities/research laboratories abroad, has organized international conferences and symposia and has mentored a large number of students at IIT Kanpur and overseas. He is a member, of the editorial board of *Pramana* and also the DST - INSPIRE Panel of the National Academies, and has also served as a member of the Science Education Panel of the Indian Academy of Sciences. Prof. Budhani is a Fellow of the American Physical Society, the Indian Academy of Sciences, the National Academy of Sciences and the Indian National Science Academy.

Dr. A.K. Bandyopadhyay gets APMP Technical Award ñ 2009

Dr. A. K. Bandyopadhyay, Scientist G and Head, Physico Mechanical Standards, National Physical Laboratory (NPL), New Delhi, has been awarded APMP Technical Award – 2009 for his outstanding contributions to the field of Mass and Related Quantities. This Award was handed over to him at the General Assembly (GA) of the Asia Pacific Metrology Program (APMP), which was held at the National Metrology Center (NMC), SIRIM, Malaysia during 17-18 December 2009.

Dr A.K. Bandyopadhyay receiving APMP Technical Award - 2009 ◀



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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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