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BSIP Celebrates

Diamond Jubilee Year (2005-2006)

The Birbal Sahni Institute of Palaeobotany, Lucknow celebrates 60th year of its existence. The celebration starts from September 10, 2005. During the year many scientific activities have been envisaged. A national conference on "*Challenges in Indian Palaeobiology: Current Status, Recent Developments and Future Directions*" will be organised during November 15 & 16, 2005.

In This Issue

New Collaborations Signed

- Memorandum of Understanding between Coal Wing, GSI, Kolkata and BSIP, Lucknow, with the objective to undertake collaborative project to establish high resolution stratigraphic relations of different Gondwana Basins.
- MOU between BSIP, Lucknow and Wadia Institute of Himalayan Geology (WIHG), Dehradun, with the objective to undertake collaborative programmes to generate high resolution multidisciplinary data (using palynological, palaeobotanical, geochemical, rock magnetic and sedimentological parameters) for interpreting age, regional correlations, palaeoclimatic and palaeoecological changes, tectonics and sedimentation history in the Precambrian and Upper Palaeozoic-Quaternary successions in the Himalayas.
- MOU between BSIP, Lucknow and Delta Studies Institute, Visakhapatnam on Studies on palaeoclimate, palaeoecology and relative sea level oscillations on the east coast of India.
- MOU between BSIP, Lucknow and National Centre for Antarctic and Ocean Research (NCAOR), Goa with the objective to undertake collaborative programmes to generate fine resolution proxy data for palaeoclimatic interpretation of the Antarctic region and its surrounding ocean.
- MOU between BSIP, Lucknow and National Institute of Oceanography, Goa with the objective to implement 5 year accord that will complement the parties research capabilities and resources in basic and applied sciences. The disciplines identified for value addition are : micropalaeontology, palynology, geochronology, placers, archaeology and palaeoclimatic studies.

Dr. N. C. Mehrotra, New Director of the BSIP

Dr Naresh Chandra Mehrotra, Ph.D. (Geology) from Lucknow University took over as Director, Birbal Sahni Institute of Palaeobotany w.e.f. 1st March 2005. He joined Oil and Natural Gas Corporation in 1980 as Palynologist after serving Birbal Sahni Institute of Palaeobotany (1972–77) and Wadia Institute of Himalayan Geology (1977–1980). At K.D.M. Institute of Petroleum Exploration, Dehra- Dun, he worked for Science and Technology projects to evaluate the hydrocarbon potential of Andaman Basin and established Paleogene-Neogene palyno-stratigraphy of Andaman Islands. Dr Mehrotra visited University of Saskatchewan, Canada (1982-1984) as post-doc Fellow on Government of India National Scholarship to carry out studies on "Phytoplankton in Oil Exploration". He joined the Regional Geological Laboratories ONGC at CRBC, Calcutta in 1986 to establish Palynology Laboratory and served as Head of Regional Geological Laboratory. In 1991, he returned to the Central Palynological Laboratory at Dehra Dun and served as Head of the Palynology Laboratory at KDMIPE (1996 - Feb., 2005). The responsibilities at ONGC labs included palynostratigraphic data back up to exploration efforts in the form of various contract, sponsored, research and essential projects. It involves preparation of palaeogeographic and palaeo-environmental facies maps; potential source rock facies delineation; development of sequence biostratigraphy; and data integration to support geological modelling. Dr Mehrotra has thirty-three years of professional experience in exploration palynology including systematics and morphology of dinoflagellate cysts and spores and pollen; palynostratigraphic, palaeoenvironmental and source rock evaluation research related to hydrocarbon exploration. In ONGC, Dr Mehrotra rose to the position of Deputy General Manager and Head Palynology. He has plans to start high impact palynological studies at the Birbal Sahni Institute of Palaeobotany, Lucknow after taking over as its Director. These studies relate to Fossil Fuel Exploration and palaeoclimate research.

He has number of awards and honours to his credit: Director KDMIPE's Merit Certificate in 1987 for report on Paleogene-Neogene Bio-stratigraphy of Andaman-Nicobar, Islands; General Manager (Expl.), ONGC, Calcutta, Merit Certificate, 1991 for meritorious work; Regional Director KDMIPE's Merit Award in 1993 for Outstanding contributions in Biostratigraphy (group award); Executive Director KDMIPE's Merit Certificate in 1999 for outstanding performance. He is also the Member of several National and International Academic and Professional Bodies. Dr Mehrotra has to his credit some 50 research papers, published in National and International Journals including 2 Books and 2 volumes of Atlas on fossil dinoflagellate cysts.

Prof K. R. Surange Felicitated

Prof Krishna Rajaram Surange, Ex-Director, BSIP was felicitated for his Lifetime Achievement

Early Life—Krishna Rajaram Surange was born on the auspicious day of Maha Shivaratri (07/02/1920) at holy city of Ujjain. He was the second son of his parents Sri Rajaram Dhondo Pant Surange and Srimati Sitabai Surange. Sri R.D.P. Surange was commissioner of Customs and Excise earlier in Ujjain and later in Gwalior where the young K. R. Surange completed the High School in 1937 from the Victoria Collegiate High School and the Intermediate examination from the Victoria College. K. R. Surange moved to Lucknow for further studies and in 1941 obtained B.Sc. Degree in Botany with Biology and Chemistry as the other subjects from the University of Lucknow. He continued his studies in the same University and was awarded the Master's Degree in Botany in 1943.

Early Career—Prof Surange worked for a doctorate under his *Guru,* Professor Birbal Sahni FRS, and produced a maiden thesis on "*Morphology of Living and Fossil Cyclanthaceae*" and was awarded the Degree in 1947. A year earlier, K.R. Surange married Kumari Sushila Joshi. Then he went to UK at the Cambridge Botany School and worked with Professor H. Hamshaw Thomas, FRS, on the subject: "Morphology of *Botryopteris* and *Stauropteris*" which earned him a second Ph.D. Degree in 1949. He had hardly returned from Cambridge when Professor Sahni appointed him Reader in the newly formed Institute in 1949. Prof Surange became Assistant Director of the Birbal Sahni Institute of Palaeobotany in 1952, Officer-in-Charge in 1953 and Director in 1959 and held this position till May 1980. Prof Surange remained Head of the Palaeozoic Department from 1953 to 1975 and during this period guided

eleven students for their Ph.D. programmes.

Contributions in establishing the Institute—Going back to the dim beginnings of the Birbal Sahni Institute it was not an easy task for anyone to pick up courage with both hands and organize an institute if only one puts himself in the position of Prof Surange. Within a week of laying the foundation stone of the institute of his dream, Professor Sahni died on 10th April 1949. The creator of the idea of a unique institute, solely for the study of the sub-discipline of palaeobotany, suddenly passed away. It was a kind of intellectual vacuum, as it were, in which Prof Surange was called upon to operate, with few seasoned palaeobotanists at hand to guide the destinies of such an institute. Nothing was formulated, no guidelines drawn; Surange and his small band of palaeobotanists had only heard from the Professor what plans he had in his mind. Undaunted, Prof Surange plunged into the task of bridging the gap by implementing the many academic plans that were verbally passed on, from time to time, by a fertile and mature mind. While his immediate task was not to fight for funds and put the Institute's brick and mortar together, his main concern was to have the research programmes under way. Not that he spared himself in the task of building the Institute; he gave of his best in that direction as well. This has not only enhanced the prestige of the Institute but has also added to the science.

Contributions to the science of Palaeobotany—Prof Surange is widely travelled and has established links for the Institute with many leading palaeobotanical centers abroad. At home Prof Surange has received many honours and awards. Notably, Fellowship of the Indian National Science Academy, Indian Academy of Sciences and the Palaeobotanical Society of India. He was awarded the Birbal Sahni Medal of the Indian Botanical Society for 1979. His international connections may be listed as : Membership of the Executive Committee of the World Organization of Palaeobotany, Membership of the International Committee for Palaeobotanical Nomenclature and Chairmanship of the Working Group in Palaeobotany and Palynology of the IUGS Sub-Commission on Gondwana Stratigraphy. Like his *Guru*, Prof Surange was also elected Vice-President of the International Botanical Congress. He chaired XII International Botanical Congress held at Leningrad in 1975. From an Editorial point of view, Prof Surange's main contribution was in the nurturing of "The Palaeobotanist", an international journal published by the Birbal Sahni Institute of Palaeobotany. It was his sustained effort and unstinted sparing of his time that has made this journal occupy a pride of place among contemporary botanical research literature.

Prof Surange remained a fundamental palaeobotanist with faith pinned on the need for morphological and anatomical approaches in classical palaeobotany. He encouraged advantages of working in other disciplines such as coal palynology, oil palynology, geochronology and study of the Precambrians.

Prof Surange has many qualities that drew him close to friends and scientific colleagues. Essentially he is a modest, self effacing scientist with unquestioned loyalty to the cause of palaeobotany and the Institute he has served with distinction. Most important of all, he responded well in formulating newer research programmes in the institute and freely sought advice from members of communities.

National Science Day

1. A Participant speaking on "Space Science is a Luxury for India", 2. Winners of the Poster Competition

In accordance with directions from the DST, the National Science Day-2005 was celebrated on 28th February 2005. This year related functions were organized for a fortnight (February 15–28) with the theme being "Celebration of Physics" to commemorate the centenary of Einstein's great discoveries in 1905. Four lectures were organized at the Institute, including two by outside speakers. On February 15, Institute scientist S. Chakraborty delivered a lecture on *Harmonic Oscillations and their Applications to Palaeoclimate.* The Officiating Director Dr Jayasri Banerji spoke on the significance of the year and highlighted the achievements of Einstein. A debate competition for school students was organized on February 22. Thirty-one students spoke for and against the topic "Space Science is a Luxury for India". On February 24, a lecture on Einstein and Theory of Relativity by Prof G. P. Gupta, Head, Department of Physics (Lucknow University), portrayed Einstein as a great intellectual. Prof Gupta explained relativity in a simple manner with illustrations. On February 26, a collage competition for school students was organized on 'Tsunami: Causes and Effects' at Institute campus. About 70 students from 9 institutions participated. A 'Face-to-Face' programme for school students on 'Tsunami' was joined in by Institute scientists-R.K. Saxena, C.M. Nautiyal, S.K.M. Tripathi and Mukund Sharma during which a large number of students asked questions on various aspects of tsunami. The Valedictory function was held on the National Science Day (February 28) with Prof Devendra Sharma, Ex Vice-Chancellor (Indore and Gorakhpur Universities) as the Chief Guest who, with illustrations, explained how Einstein's theory helped in understanding stellar behaviour. Institute scientist C.M. Nautiyal in his talk on Planets, Plants and Physics outlined the geological, geographical and climatic conditions on various planets; discussed how they were greatly governed by physical laws and illustrated how it would influence life forms, if any. A speech-competition for degree-students was also held on this day on the topic "Space Science is a Luxury for India". The Officiating Director chaired the session and paid tributes to Professors Raman and Einstein. The Chief Guest gave away prizes to winners of various competitions. In all, 24 prizes were awarded in the form of science books, etc. All participants of collage competition were given small booklets of Prof C.V. Raman's lecture titled 'Why the Sky is Blue'. The Day was observed as an Open House.

Medals and Awards

T. M. Harris Medal - 2004

Prof Anil K. Gupta, IIT - Kharagpur, India; Dr David M. Anderson, Colorado, USA; Prof Jonathan T. Overpeck, Arizona, USA awarded T.M. Harris Medal - 2004 for their paper in Nature, 421 : 354-357.

Chunnilal Khatiyal Medal

Dr Binita Phartiyal

Dr Binita Phartiyal, Scientist 'A' was awarded Chunnilal Khatiyal Medal for the year 2004 in recognition of her contributions to the Quaternary deposits of Ladakh.

The awardee has been successful in mapping and reporting the fluvio-glacio-lacustrine Quaternary deposits in the Ladakh region (between 77-79º longitude and 32-36º latitudes). Due to the rugged topography, high altitude (3000-6000 m) and strategic restrictions (being the international boundary with Pakistan and China) not much work has been done in Ladakh region of the north-western Indian Himalaya although being rich in Quaternary deposits. Previous Quaternary research in the region has been focused on the glacial sequences and only some scattered data of the lacustrine deposits is available. The reconstruction of the palaeo-lacustrine deposits and the present day lakes and their distribution in the Ladakh region was done for the first time. The results show that the region was under the influence of tectonic activity and cold climate during the late Quaternary times. Tectonic activity at ~50,000 yrs BP, ~35, 000 yrs BP and 26,000, 24,000 and 21,000 yrs BP has been recorded. Three major lakes existed in the region in the Late Quaternary. These were formed due to the damming of the Indus river and its tributaries by debris avalanches initiated mainly by tectonic activity along the Indus Suture, Shyok Suture and the Karakoram Fault. These are the Spituk-Leh palaeolake formed ~>50,000 yrs BP; the Lamayuru palaeolake dated to 35,000 yrs BP in the Indus Valley and the Khalsar palaeolake > 60 km in length in the Shyok Valley. A glacial lake at Bhaktpur city, north of Baralacha La is completely overfilled, the TsoKar lake has been subdivided into smaller units and the water level is lowering. Limited chemical weathering, rapid erosion and cold climatic conditions in the region are suggestive by the stable Illite values in the Lamayuru section in the late Quaternary times. Three levels of palaeoseismic structures (convolute structures, sand dykes, intraformational folds, micro faulting, etc.) are present in the Khalsar section and at three levels in the Tirit section (at Shyok, Nubra confluence). The results have been published in the journal "Geomorphology" (2005, 65/3-4, 241-256). This piece of work will be a guide for the Quaternary researchers working on various parameters to locate and sample the deposits for a generation of results which can be compared to the well studied sections of Pakistan and Tibet. The awardee feels that this is the best work she has done to define the quaternary deposits of Ladakh, however, the work on preparation of a palaeoclimatic model in the Quaternary times of the area (using, mineral/ environmental magnetism, clay mineral, Total Organic Content, Loss on Ignition, sedimen-tological and geochemical parameters) and a palaeoseismic model of the area (by recording/demarcating and dating the levels of palaeoseismic structure levels) is under progress.

She has also worked on the Late Quaternary Kumaun Himalayan sediments. A major achievement in these sediments was that a reversal (geomagnetic excursion) is recorded at 20,900-19,100 yrs BP in two palaeolake profiles one at Champawat District (Phulara and Chauki sections) and the other at Pithoragarh District (Riyasi section) of the Uttaranchal State in Kumaun Lesser Himalayas. The results have been accepted for publication.

Publications Released

During the Founder's Day celebrations, Institute's publications were released by distinguished speakers and Chairman BSIP, Governing Body.

- BSIP Newsletter 2004
- *The Palaeobotanist* 53
- Bilingual Annual Report 2003-2004

Prof P. Ramachandra Rao releasing BSIP Newsletter 2004

Eighth Jubilee Commemoration Lecture

Prof P. Ramachandra Rao

The Institute celebrated its 58th Foundation Day on September 10, 2004. On this occasion Professor P. Ramachandra Rao, Vice Chancellor, Banaras Hindu University, Varanasi, delivered '8th Jubilee Commemoration Lecture' on the topic "*Trees: An Engineer's Delight*". Professor Rao highlighted importance of trees in the application of material engineering. Professor S. B. Singh, Vice Chancellor, Lucknow University, Lucknow presided over the function. Many guests and scientists from outside the Institute attended the function.

TREES: AN ENGINEER'S DELIGHT

Trees, seen all around us, are products of nature that have survived complex and often harsh competition for space and energy. In their struggle for survival over millions of years, they have optimized their biological structures and developed survival mechanism that can minimize stress concentrations, distribute loads evenly, repair themselves in case of minor and local failures and grow with shapes that avoid predetermined failure points. Some of these aspects, known from the 19th century, have remained unanalyzed. It is not often realized that the specific strength of wood is four times that of mild steel or that wood and steel show comparable stiffness per unit weight. The fracture toughness of wood is ten times that expected from simple theoretical considerations. These properties are highlighted with suitable examples. The advent of microscopy has made possible a scientific study of the microstructure of wood and enabled an understanding of its hierarchical nature. The length scales involved range from molecular to macroscopic. The hierarchical architecture of cellulose aggregates in wood provides an excellent example of a natural composite. Hierarchical material systems in nature are characterized by recurrent use of same molecular constituents (cellulose, collagen, etc.) controlled orientation of the structural element, durable interfaces between hard and soft constituents, properties that are tailored to respond to changing needs, capacity for self healing or repair and control on shape. It is only recently that engineers have attempted to model these structures and utilize the models to design engineering structures. It is increasingly becoming possible to optimize properties and minimize the consumption of material. Study of their hierarchical biological structure has resulted in the design of better composite materials for engineering applications and development of intelligent or smart materials. The progress made with some recent examples can be illustrated. Besides, their mechanical properties, trees also exhibit a wide variety of physical phenomena such as capillarity and photosynthesis.

(Summary of the 8th Jubilee Commemoration Lecture)

Founder's Day Memorial Lectures

On November 14, 2004 – the Founder's Day, the Institute's staff and distinguished guests from other organizations offered *Pushpanjali* on the *Samadhi* of the Founder Professor Birbal Sahni, FRS in the campus. Same day in the evening two memorial lectures were organized. Professor A. K. Singhvi, Planetary and Geosciences Division, Physical Research Laboratory, Ahmedabad delivered the '34th Birbal Sahni Memorial Lecture' on the topic "The Human Dimension of Geosciences". Professor S. K. Tandon, Research and International Relations and Dean, Department of Geology, University of Delhi, New Delhi delivered the '50th Sir Albert Charles Seward Memorial Lecture' entitled "Stratigraphic Records of Late Quaternary Climate Shifts in the Thar and its Margins". Professor J. S. Singh, Chairman, Governing Body of the Institute presided over the function. Several guests and scientists from outside the Institute attended the occasion.

Prof S. K. Tandon, Speaker 50th Sir Albert Charles Seward Memorial Lecture lighting the Lamp

Stratigraphic Records of Late Quaternary Climate Shifts in the Thar and its Margins

The reconstruction of Quaternary climates has become increasingly significant because of the utility of these data in testing the realism of the predictive capability of different climate models. Understanding the climate changes of the past is a challenging task as it involves an objective assessment of the temporally constrained proxy-indicators of climate in their palaeoenvironmental and spatial context.

Three fundamental kinds of climate forcing—tectonic processes, earth-orbital changes and changes in the strength of the Sun exist in the natural world. These forcing functions cause the components of the earth's climate system to vary widely over characteristic response times— a measure of the time for some aspects of the climate system to respond to a climate forcing function. Depending upon the nature of the forcing function, components of the climate system may respond on variable timescales ranging in order from tens of millions of years to millennia, centuries and decades. Corresponding landscape responses can also be tracked on various timescales, for example, decadal, century, millennial and higher order timescales of 104-106 years. Palaeoclimatic studies, therefore, require high resolution temporal constraints and are rooted in stratigraphy.

The Thar and its margins have been studied for the past three decades for their palaeoclimatic archives. Pioneering work was carried out by the BSIP in the early seventies on the pollen records and radiocarbon dating of the lake sequences of Didwana, Sambhar and Lunkaransar. Following these pioneering studies by the BSIP, new data on Late Quaternary climates of the Thar have been generated in the last decade on a variety of stratigraphic records such as fluvial sequences, calcretes, and aeolian sequences. More recently, the lake sequences of Lunkaransar and Sambhar have been re-examined using data from the Sabarmati and Mahi basins that occur on the southwestern margin of the Thar. Little progress has 'however' been made in the reconstructions of the Late Quaternary climates history of the northeastern margin of the Thar, despite the occurrence of suitable aeolian, lake and pan deposits.

The responses of different components of the arid and semi-arid landscape system i.e., pedogenic calcrete, river basins, lakes, and aeolian dunes and sand sheets vary over different timescales; the

relative sensitivity of these response systems to climate change should therefore be factored into palaeoclimatic reconstructions.

Finally, there is a strong need to develop regional scale models with predictive capability for the Indian subcontinent. *(Excerpts from 50th Sir Albert Charles Memorial Lecture, Professor, Research and International Relations & Dean, Department of Geology, University of Delhi.)*

Prof A. K. Singhvi,
Speaker 34th Birbal Sahni Memorial Lecture lighting the Lamp

The Human Dimension of Geosciences

There is an increasing awareness that the evolution and survival of the societies and cultures needs a geological consent. It is now well established that the anthropogenic changes in the ecosystems and the environment now equals (and at times exceed) the geological rates for the past few hundred thousand years. Evidence from the Vostok ice core data clearly indicates that the Earth system is now functioning well outside its normal operating range and it is important to determine if the Earth System as a whole will move to an altogether new state or will return to its pristine state if the human perturbations are minimized. These considerations have raised new questions on the issues such as the changes in weather patterns on various spatial and temporal scales that are intimately connected to issues such as the human survival, the food security and human migrations.

Several new international initiatives are now underway, to focus and synergize research in these areas of societal relevance. I will describe two new international initiatives viz. the International Geosphere -Biosphere Programme (IGBP; Phase - II) and the International Year of the Planet Earth - 2005-07 (IYPE). Both the programmes recognize the fact that during the coming decades, geosciences along with the biological sciences will play a key role in Human survival. The biological sciences deal with the understanding of life and processes that contribute to it and the IGBP deals with the environment that sustains it. The IGBP programmes in their Phase -II aim to better understand the processes and feedbacks on biogeochemical aspects of Global Change. The IYPE on the other hand looks after equally important issues such as water, the limits of earths capabilities of decontaminating itself, subsurface townships, the climates and the oceans, the soils, etc. and aims to focus the attention of the scientists, the stake holders and the policy makers to these issues. My aim is to describe the key elements of these programmes and their scientific importance and also attempt to provide a personal viewpoint on the issues the Indian palaeoclimate science can address, given that the India offers an ideal locale for palaeoclimate and global change research in all its dimensions. A key element of Indian palaeoclimate research is to understand spatial and temporal variability of the monsoon. Our recent studies in southern Indian tanks indicate that the use of oceanic records to infer monsoon performance on land may not be correct, *sensu-stricto*. There is a need to replicate such studies on geologically simple systems so that they can provide a realistic database for important future modelling efforts.

(Excerpts from 34th Birbal Sahni Memorial Lecture, Planetary and Geosciences Division Physical Research Laboratory, Ahmedabad- 380 009).

Research Notes and Articles

Green Issues: Conservation of Plant Biodiversity

India is one of the world's 12 megadiversity areas, with over 45,000 wild plant species and 77,000 wild animal species registered, accounting for about 6.5 per cent of the world's known wildlife. The diversity of living forms in India is the result of climate, soil variability, cultural and ethnical diversity. There are over 53 million tribal people in India, belonging to 550 communities. There are three megacentres of endemic biodiversity in India - the Western Ghats, the Eastern Himalayas and the Western Himalayas and 25 micro-endemic centres. The total endemic taxa of flowering plants in the country number about 148 genera and 5725 species, of which 3471 taxa are in the Himalayas, 2015 in peninsular India and 239 in the Andaman and Nicobar Islands.

Biological diversity or biodiversity, in the sense of a biologist is considered as the natural stock of genetic material within an ecosystem. The actual number of genes existing in an ecosystem may determine this natural stock. This brief account of speciation and extinction demonstrates the facet of biological diversity that is the nature of a non-renewable resource. The diversity of biological resources is a one-time endowment from the evolutionary process. Management of biodiversity concerns the management of the unique characteristics of this one-time endowment from the evolutionary process. In this backdrop, the present article deals with the different aspects of biodiversity, loss of biodiversity, its causes, an overview of plant diversity in India, threatened plant species, biodiversity conservation methods, biodiversity convention and biodiversity management.

Biodiversity includes three different but closely related aspects:

Genetic diversity (diversity within species)—This constitutes distinct population of the same species or genetic variation within population or varieties within a species.

Species diversity (diversity between species)—It refers to the variety of species within a region. Such diversity could be measured on the basis of number of species in a region.

Ecosystem diversity—It refers to the communities in various ecological niches within the given ecosystem. Each community is associated with definite species complexes. These complexes are related to composition and structure of the biodiversity.

Biodiversity at global level—It is estimated that there exists 5-30 million species of living forms on our earth. Of these, only 1.5 million have been identified. These include 3,00,000 species of green plants and fungi, 8,00,000 species of insects, 40,000 species of vertebrates, and 3,60,000 species of microorganisms.

The tropical forests are regarded as the richest in biodiversity. Scientists are of the opinion that whatever be the absolute numbers, more than half of the species on the earth live in moist tropical forests which is only 7% of the total land surface. Insects (80%) and primates (90%) make up most of the species. For instance, from a single tropical leguminous tree 43 ant species belonging to 26 genera have been retrieved.

Biodiversity in India—The Indian region (8º-30ºN and 60º-97.50ºE) having a geographical area of 329 million hectares is quite rich in biodiversity with a sizable percentage of endemic flora and fauna. This richness in biodiversity is due to immense variety of climatic and altitudinal conditions coupled with varied ecological habitats. These vary from the humid tropical Western Ghats to the hot desert of Rajasthan, from the cold desert of Ladakh and the icy mountain of Himalayas to the warm coasts of peninsular India. The country has over 1,15,000 species of plants and animals already identified and described. Over 167 important cultivated plant species and some domesticated animals have originated in India. To name a few the following crops arose in the country and disseminated throughout the world are: rice, sugarcane, Asiatic vignas, jute, mango, citrus, banana, several species of millets, several cucurbits, some ornamental orchids, several medicinal and aromatic plants. There are several examples of plant germplasm from India making significant contributions to plant improvement.

Two cases are well known i.e., nearly 20 cultivars of rice contain useful genes from wild rice of Kerala, which are responsible for resistance in cultivated rice; and the contribution to the muskmelon industry of California by powdery mildew-resistant genes from the wild muskmelon of our country.

Conservation methods of biodiversity— Basically, the conservation plan has a holistic approach and encompasses whole spectrum of biota and activities ranging from ecosystems at the macro level (*in situ* conservation) to DNA libraries at the molecular level (*ex-situ* conservation).

In situ* Conservation—In situ* conservation refers to protection zones and areas of high biological diversity. These areas, described as natural ecosystems, will protect species with minimum human interference. For preservation of the endangered species, the only measure suggested is the strict protection against poaching of both vegetation as well as animal resources. Since most of the threatened organisms occur as components of biotic communities in open sites, restoring them in such habitats through judicious protection measures is required. For *in-situ* conservation, the biosphere reserve offers the best site of natural conservation of threatened flora. Today, India has 75 national parks and 421 wildlife sanctuaries covering an area of about 1.4 lakh km^2 constituting more than 4% of the total geographic area of the country, and one-fifth of the forest area. India's efforts at countering the rapid erosion of biodiversity have been significant as it provides the world's largest network of protected areas for *in situ* conservation.

The conservation efforts towards plant species have not been given adequate attention particularly of those, which are of potential economic and scientific value. The other important aspect is to incorporate rehabilitative strategies for rare, threatened and endangered plant and animal species.

Scientific studies in regard to *in situ* conservation should focus on the following lines where very little data are available:

- Applied research for conservation of living resources;
- Inter-linkages between plant and animal species;
- Quantitative assessment of the conservation status of the species; Successional status of key species in different ecosystems;
- Multiplication and restoration of endangered, rare and endemic species using biotechnology;
- Ecological restoration of degraded micro and macro-habitats;
- Identification of critical index species and their sensitive parameters;
- Assessment of the impact of exotic species on the ecosystem;
- Determination of the impact on the ecosystem of various activities in the protected areas;
- The possible climate change and its impact on biodiversity;
- Hydrological changes including surface run-off and percolation in the protected areas;
- Primary production and cycling of nutrients in the soil;
- Studies on satellite mapping of all protected areas; and
- Development of methodologies for classification of microhabitats.

The important point in *in situ* conservation is that the forest trees, wild plants, wild animals and microorganisms all occur together in an ecosystem. Therefore, if an attempt is made to conserve and enrich the ecosystem, much can be achieved in a single step. This would be particularly advantageous in tropical forests where many species occur in low densities and have a high degree of endemism. Obviously there is an urgent need to coordinate efforts on the ground level. This would save not only time and effort but also the scarce fiscal resources and infrastructure. Local communities need to be involved in the management of biological resources and to benefit from their sustenance. This can be achieved by integrating rural development with ecosystem conservation.

***Ex-situ* Conservation**—India has done commendably well as far as *ex-situ* conservation of crop genetic resources is concerned. It has also taken up such work on livestock, poultry and fish genetic resources. However, there is need to develop facilities for long and medium term conservation through:

- Establishment of Genetic Enhancement Centres for producing good quality of seeds;
- Enhancement in the existing zoos and botanical garden network;

- Seed-gene banks;
- Tissue culture gene banks;
- Pollen and spores banks;
- Captive breeding in zoological gardens; and
- In-vivo and in-vitro preservation.

However, both *ex-situ* and *in situ* conservation of forest trees and microorganisms (except nitrogen-fixing blue-green algae) have not received much attention. *Ex-situ* and *in situ* conservation should be given equal importance as measures in biodiversity conservation. Release of genetically modified organisms should be regulated at national and international level, and there should be adequate dissemination of information about such release by the respective countries.

Biodiversity Convention and Conservation— The Earth summit held at Rio de Janeiro (Brazil, during June 3 and 14, 1992) to mark the opening of the convention on biological diversity took place in the afternoon of June 5, 1992. Feranando Collor, the President of the Federal Republic of Brazil was the first to sign the convention, followed by India, and 155 other nations.

The basis of the convention on biodiversity is the recognition of the fact that the animal arid plant life on the earth is endangered by the over-exploitation and excessive emission of toxic gases by the industries in the developed world.

The main features of the convention are:

- The authority to determine access to genetic resources rests with national governments and is subject to national legislation;
- The commercial benefits arising out of the use of biological resources of a country will be shared with that country on an equitable and fair basis;
- The access to the transfer of technology to developing countries will be provided under fair and most favourable terms mutually arrived at. In case of technology subject to patents such access and transfer shall be provided on terms, which recognize and are consistent with the adequate protection of intellectual property rights.

Loss of Biodiversity—The loss of biological diversity is a global crisis. Biological extinction has been a natural phenomenon in geological history. But the rate of extinction was perhaps one species every 1000 years. But man's intervention has speeded up extinction rates all the more. Between 1600 and 1950, the rate of extinction went up to one species every 10 years. Currently it is perhaps one species every year.

The destruction of the world's tropical forests, which are disappearing at an alarming rate, is one of today's most urgent global environmental issues. Rich species diversity is slowly being lost forever. Tropical forests are estimated to contain 50 to 90 per cent of the world's biodiversity.

Threatened biodiversity—"Red Data Book" is the name given to the books dealing with threatened plants or animals of any region. Many countries have prepared their own Red Data Books (e.g., Britain, New Zealand, etc.). Its opposite is the "Green Book", which lists rare plants growing in protected areas like botanic gardens. A mimeographed Green Book for India has been brought about. It deals with about a hundred rare plant species growing in garden of Botanical Survey of India (BSI). The BSI has also compiled three volumes of Red Data Book having information on endangered plant species.

Endangered—The species with fewer individuals because of unfavourable environmental or human factors and that its natural regeneration is not able to keep pace with exploitation or destruction by natural and unnatural means.

Rare—The species (or taxa) with small world population that are not at present endangered or vulnerable, but are at risk. Such species are usually localized within restricted geographical areas or habitats or are thinly scattered over a more extensive range. Some species are naturally rare and have never occurred in greater numbers, yet they are able to maintain these numbers. Other species become rare through man's action or other unnatural forces.

Extinct—Species that are no longer known to exist in the wild but survive in cultivation. Generally, the term 'Extinct' is used for the species that are no longer known to exist in the wild.

Threatened—It is a broader term that is used for species that fall into any of the above categories.

THREATENED PLANT TAXA

- **Plants of Ornamental Value**—*Aerides crispum* (Orchidaceae), *Cymbidium aloiflium* (Orchidaceae), *Diplomeris hirsuta* (Orchidaceae),

Paphiopedilum fairieyanum (Orchidaceae), *Qaphiopedilum drurui* (Orchi-daceae), *Rhododendron edgewortythii* (Ericaceae), *Symplocos chengapae* (Symplocaceae).

- **Plants of Medicinal Value**—*Acorus calamus* (Araceae), *Atropa acuminata* (Solanaceae), *Dioscorea deltoidea* (Dioscoreaceae), *Drosera* species (Droseraceae), *Podophyllum hexandrum* (Podophyllaceae), *Rauwolfia serpentina* (Apocyanaceae), *Saussurea lappa* (Asteraceae).
- **Plants of Scientific/Academic Value**—*Balanophora involucrata* (Balanophoraceae), *Dischidia benghalensis* (Asclepiadaceae), *Nepenthes khasiana* (Nepenthaceae), *Sapria himalayana* (Rafflesiaceae).
- **Plants of Phytogeographic Significance**—*Ceropegia jainii* (Asclepiadaceae), *Frerea indica* (Asclepiadaceae), *Glyphochola mysorensis* (Poaceae), *Helicanthes danser* (Loranthaceae), *Jainia nicobarica* (Rubiaceae), *Manisuris divergens* (Poaceae), *Willisia warm* (Podostemaceae).
- **Trees of Forestry Importance**—*Dysoxylum malabaricum* (Meliaceae), *Pterocarpus santalinus* (Fabaceae).
- **Other Economic Plants**—*Decussocarpus wallichianus* (Podocarpaceae), *Phyllostachys bambusoides* (Poaceae), *Pinus gerardiana* (Pinaceae), *Santalum album* (Santalaceae).

CAUSES FOR THE LOSS OF BIODIVERSITY

Some of the important proximate causes for the loss of biodiversity are as follows:

Destruction of habitat—Man for his settlement, grazing grounds, agriculture, mining, industries, highway construction, drainage, dam building, etc, may destroy the natural habitat.

Hunting—From time immemorial, man has hunted for food. Commercially important plants and animals of economic importance are haunted for their products.

Over exploitation—This is one of the main causes of the loss of not only economic species but also biological curiosities like the insectivorous and primitive species and other taxa needed for teaching or laboratory work (like *Nepenthes*, *Gnetum*, *Psilotum*, etc.). Plants of medicinal value like *Podophyllum hexandrum*, *Coptis teeta*, *Aconitum*, *Discorea deltoidea*, *Rauvolfia serpentina*, etc. and horticultural plants like orchids and rhododendrons come under the over-exploited category.

Collection for zoo and research—Animals and plants are collected throughout the world for zoos and biological laboratories for study and research in science and medicine.

Introduction of exotic species—Native species are subjected to competition for food and space due to introduction of exotic species.

Control of pests and predators—Predator and pest control measures, generally kill predators that are a component of balanced ecosystem and may also indiscriminately poison non-target species.

Pollution—Pollution alters the natural habitat. Water pollution especially injurious to the biotic components of estuary and coastal ecosystem. Toxic wastes entering the water bodies disturb the food chain, and so to the aquatic ecosystems. Insecticides, pesticides, sulphur and nitrogen oxides, acid rain, ozone depletion and global warming too, affect adversely the plant and animal species. The impact of coastal pollution is also very important. It is seen that coral reefs are being threatened by pollution from industrialization along the coast, oil transport and offshore mining. Noise pollution is also the cause of wildlife extinction.

Deforestation—One of the main causes for the loss of biodiversity is population explosion and resultant deforestation. In India, the rate of deforestation is 13,000 sq. km. annually. If this rate of deforestation continues, one can imagine the ultimate fate of our forest and biological richness. It is presumed that in coming years, the global loss of biodiversity from deforestation alone would be 100 species everyday.

Other factors—Other ecological factors that may also contribute to the extinction of plant and animal species are: (a) Distribution range - The smaller the range of distribution, the greater the threat of extinction. (b) Degree of specialization - The more specialized an organism is, the more vulnerable it is to extinction. (c) Position of the organism in the food chain - The higher the organism is in food chain, the more susceptible it becomes. (d) Reproductive rate - Large organisms tend to produce fewer offspring at widely spaced intervals.

Threatening of biodiversity due to human activities, Socio-economic and Political Causes—The socio-economic and political causes of biodiversity loss vary from region to region. In recent times, they can be linked to governmental and international support for industrial forestry, agriculture and energy programmes. In South-East Asia, it is the tropical timber industry that is cutting down the last primary rainforests, against the will of local people. In developing countries like India, the development policies and projects have rarely been sensitive to the need for biodiversity conservation, and that of "the local communities". The Government's failure to remove poverty and curb middleclass consumerism has led to conditions in which sensible natural resources management assumes low priority.

An overview of floral diversity in India—The vast geographical, diverse climate and topographical realms of India have resulted in enormous ecological diversity supporting about 8% of the world's biological diversity on 2% of earth's surface making it one of the 12 mega diversity countries in the world. Adding to this there is a very high diversity of human influenced ecosystems including agricultural and pasture lands and impressive range of domestic aided plants and animals. The floral resources of India comprise about 45,000 species representing about 11% of world's known flora. Number of recorded species in major groups of plants are about 17,500 in angiosperms, 48 in gymnosperms, 1,200 in pteridophytes, 2,825 in bryophytes, 6,500 in algae, 2,060 in lichens, 14,500 in fungi and 850 bacteria and viruses. Nearly 29% of these plant species are endemic to India with main centers of endemism in Himalayas, North-East India, Western Ghats and Andaman & Nicobar islands. The natural forest covering about 19.27% of total geographical areas are known repositories of bioresources in the form of food, fodder, fuel, timber, medicines, fibres, resins, tannins, dyes, oils, fruits, vegetables, etc.

Biodiversity Management—India has one of the largest networks of protected areas in the world. Besides its national parks and sanctuaries, eight biodiversity-rich areas have been designated as biosphere reserves to conserve representative ecosystems. Five of the protected areas have been designated world heritage sites under the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage List. Six wetlands have been designated under the Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention) and a further 11 wetlands have been identified for intensive conservation and management.

Before the arrival of colonial rule, tribal and local communities managed forests. Wood and non-wood forest products were generally used in a sustainable manner, since people's lifestyles were simple and their needs were few. From the middle of the nineteenth century, however, the management of forests became the responsibility of government forest departments.

Today, India has a well-developed institutional infrastructure for *ex-situ* preservation of plants, forest trees, farm animals and fish. The Indian Council of Agricultural Research (ICAR) has established national bureau of plant, animal and fish genetic resources. The National Bureau of Plant Genetic Resources (NBPGR) has created, with assistance from the United States Government, one of the world's largest repositories for the conservation of seeds of economic plants. NBPGR is a national organization with a broad mandate to provide vital support in the form of required germplasm to the country's crop improvement programmes and to act as custodian of India's genetic resources of cultivated plants and their wild relatives. Besides its network of 12 regional stations and base centres in different agro-ecological regions of the country, it has strong links with: Crop-based ICAR institutes, National research centers, All-India Coordinated Crop Improvement projects, State agricultural universities, Relevant government departments, NGOs, Research foundations, Private-sector research and development programmes.

The Ministry of Environment and Forests conserves forest genetic resources and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) maintains a large *ex-situ* collection of crop germplasm of chickpea, pigeon pea, sorghum, millet and groundnut. ICRISAT contributes to sustainable improvement in agricultural productivity in the semi-arid tropics through international research and related activities. It does this in partnership with national research systems and countries where its mandate crops are relevant to improving nutrition and well being,

especially among poor people. Need for public awareness and participation: Mass media and educational institutions can play a key role in this area. Information material should be prepared for this purpose. Different forms of communications should be mobilized and modern information technology used to document, validate and disseminate information on the intellectual property rights of communities.

Amit K. Ghosh

Intellectual Property Rights

We live in a market driven society. In recent years, innovation derived growth in science and technology has become both commercially and socially viable. Commercialization of scientific discoveries helps to empower country's technological base. There is a serious urge to protect creations of mind. New legal and institutional devices are required to safeguard mind's creations such as art, inventions, literature and designs.

International trade has become more relevant and competitive, which requires newer means of protecting product. Development of new products, processes and technologies and subsequent wealth creation in the modern world has far reaching consequences. New knowledge economy stresses intellectual property generation, protection and exploitation for societal benefit. Material transfer and benefit sharing are key concepts in the current IP regime.

Intellectual Property is a category of property - that confers rights over intangible creations of human intellect. Intellectual Property Rights (IPRs) relate to pieces of information that can be incorporated in tangible objects. Intellectual Property is the information as such. These rights are exercised with respect to the products containing the protected information. Since IPRs are normally exclusive rights and since these rights are exercised through the products having the protected information, IPRs have a direct and significant impact on trade & industry.

Intellectual property is an effective policy instrument for any country to elevate socio-economic, technological and political status. Protection of moral and material interest resulting from any scientific, literary or artistic production of which he/she is the author has become a right. And the scientific advancements and its benefits should be shared for societal betterment. There are many Acts relevant to IPR aspects such as The Patents Act, 1970, The Copyright Act, 1957, The Trade Marks Act, 1999, The Geographical Indications of Goods (Registration and Protection) Act, 1999, The Designs Act, 2000, The Protection of Plant Varieties and Farmers' Rights Act, 2001, The Semiconductor Integrated Circuit Layout Design Act 2000 and Trade Secret (Protection of undisclosed information) Act. No exclusive legislation exists but the matter would be generally covered under the Contract Law. The Indian Patents Act 1970 has been amended in 1999, 2002 and 2005 to meet the challenges posed by globalization.

The concept of IPR encompasses

Copyright—all artistic creations;

Trademarks—signs distinguishing products & services;

Patents—all inventions qualifying the national laws;

Geographical indications—natural or manufactured products distinctive of a place;

Designs—aesthetic value opposed to functional element;

Circuits—high value products;

Trade Secrets—inventions protected by contractual means;

Plant varieties—protected by *sui generis* laws.

Patents—Patent is an official written document giving the holder the sole right to sell something they have invented for a stated number of years. Thus patents give legal rights over processor product inventions that entitle the owner to prevent others from unauthorized manufactures use or sale of such inventions. In other words patents are grants issued by a Government confirming the exclusive right to make, use or sell an invention. A patentable invention needs to meet the requirements of novelty, non-obviousness and usefulness -both for processes and products.

Copyright—means the exclusive right to do or authorize others to do certain acts in relation to (1) literary, dramatic or musical works (2) artistic work

(3) cinematograph film and (4) record.

A Work has to be in a tangible form

It is the expression of the idea that is copyrighted and not idea per se

- Facts cannot be copyrighted.

Exemptions

1) fair dealing for purpose of private use including research;

2) fair dealing for purposes of criticism, review, parody and news reporting;

3) certain educational uses;

4) certain uses by libraries and archives;

5) certain uses for the purposes of public administration (such as use for Parliamentary and Judicial proceedings).

In Digital Environment it is essential to get the right balance between protecting copyright and ensuring adequate access to knowledge. Along with the issues of access to affordable infrastructure, "fair use" exemptions to IPR laws are also crucial to bring education to all & facilitate research.

Trademarks—Are signs or symbols registered by a manufacturer or merchant to identify goods and services;

Enables the owner to exclude imitations that confuse the public.

Geographical Indications—signs or expre-ssions used to indicate that a product or service originates in a country/region or specific place.

Industrial Designs—Normally protects the ornamental or aesthetic aspect of an industrial article.

Layout designs of Integrated circuits—protects the layout (or topography) of integrated circuits;

Protection limited to the design as such;

Reverse engineering generally allowed.

Trade Secrets—Protection against unauthorized disclosure or use of confidential information (of a technical or commercial nature);

An indirect type of protection based on a factual characteristic of information (its secret nature) and its business value.

Breeder's Rights—Protection conferred on plant varieties that are new, stable, homogeneous and distinguishable;

Not to affect Breeder's exception and farmer's privilege.

Utility Models—Protects the functional aspects of models and designs generally in the mechanical field;

Novelty and inventiveness are normally required;

criteria less stringent than the criteria for patenting.

Potential of Intellectual Property—Creating an innovative rather than an imitative research culture;

Creating a strong value proposition for corporate identity;

Investing in R&D in a knowledge-led manner;

Accessing global opportunities through sharing and cross - licensing IP;

Adding value to the country's global aspirations by being a respected member of the Intellectual League of Nations.

TRIPS Agreement and IPR Regime

Growing importance of technology in international competition especially in technology intensive goods and services gave a new realization about protecting intellectual property. OECD countries account for 74% world R&D expenditure. US dominance in manufacturing technology challenged in 80s by Japan and newly industrializing countries (NICs) - too open a technological and scientific system was perceived to be responsible for the decline of US. Monopoly rights granted by IPRs thought of as a solution to slow down the process of industrialization in countries which were emerging as competitors. Globalization of economy gave rise to inconsistency between globalizing production processes and national legislation (obligation to locally work a patented invention) - diffusion of innovations through trade and not through transfer of technological and industrial capability has become increasingly focused.

Emergence of new technologies; e.g., Information Technology and Biotechnology also added new dimension to Intellectual Property Rights. There are efforts to protect computer programmes under copyright law and efforts to protect all kinds of living forms. A minimum standard of protection for IPRs has evolved after negotiations with powerful countries like US. This lead to TRIPS Agreement which provides for minimum universal standards on patents, copyrights, trademarks, industrial designs, geographical indications, integrated circuits and undisclosed information (trade secrets). Countries can choose the appropriate method to implement the TRIPS Agreement within their own legal system and practice. According to Article 7 of TRIPS Agreement-The protection and enforcement of intellectual property

rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations.

According to Article 8- Members may, in formulating or amending their laws and regulations, adopt measures necessary to protect public health and nutrition, and to promote the public interest in sectors of vital importance to their socio-economic and technological development, provided that such measures are consistent with the provisions of this Agreement. Appropriate measures, provided that they are consistent with the provisions of the Agreement, may be needed to prevent the abuse of intellectual property rights by right holders or the resort to practices which unreasonably restrain trade or adversely affect the international transfer of technology. Promoting FDI through JVs and other partnering mechanisms to augment growth and realize the true potential of Indian scientific talent.

A. Rajanikanth

A Window on the Archaeology

Prof Birbal Sahni, since his childhood, was always a dreamer and visionary. He formed deep attachments from his early days. The small town of Bhera where he was born, had been a flourishing centre of trade, which had the distinction of an invasion by the iconoclast, Mahmud of Gazni. The immediate interest that centres around Bhera is enhanced by the fact that this town is situated not far from the Salt Range, which may be regarded as a veritable Museum of Geology. Excursions to these barren ranges, where lie some of the most interesting episodes and turning-points of Geology. We often associate Bhera with Prof Sahni where he spent his childhood. Here occurred certain plant-bearing formations, on the geological age of which Prof Sahni made important contributions. All these paved the way for him to undertake the geological and archaeological studies in his massive fold of research contributions. He was greatly interested in archaeology. To this his studies of the Yaudheya Coin Moulds from Khokra-kot at Rohtak (1936) and from Sunet near Ludhiana (1941) bear witness. These archaeological discoveries by a palaeo-botanist, with a stroke of geologist's hammer, symbolize the vitality and versatility of the man. It is a tribute to his genius that he threw himself heart and soul into the studies of the coin moulds. It was the affection and the high esteem in which he was held by his friends, like Rai Bahadur Daya Ram Sahni, Prof E. J. Rapson, Dr K. P. Jayaswal, Dr V. S. Agrawal, Professor Jaya Chandra Vidyalankar, Rai Krishnadas and Rao Bahadur K. N. Dikshit. He published his results on "The Technique of Casting Coins in Ancient India" in a masterly monograph in the Memoirs of the Numismatic Society of India in 1945, setting a new standard of research in the subject. For this purpose he set himself to the study of some of the Indian coin moulds as well as those from China. This won him the Nelson Wright Medal of the Numismatic Society of India.

Prof Sahni in 1936 reported some food grains from Khokra-kot. He assessed the values of archaeological discoveries for the understanding of early man, during the period which constitutes a link between the time scales of the geologists on one side and of the prehistoric archaeologists on the other. The Foundation Stone of the Institute laid by Pandit Jawaharlal Nehru was designed by Prof Sahni, consisting of 77 samples of plant fossils from all over the world, embedded in a block of coloured cement. Charred rice grains from Khokra-kot and wheat grains from Mohenjo-Daro were also implanted by him in the Foundation Stone, looking in retrospect for the future scope of archaeological plant remains also in the research activities of the Institute.

One cannot overlook the transpose of love for archaeology from a teacher like Prof Birbal Sahni into one of his pupil, Dr R. V. Sitholey. Being a palaeobotanist in traditional sense, Dr Sitholey at a later time in 1976 produced a monumental archaeological work, on the identification of about 40 representations of plants in the bas-reliefs on the gateways of the Great Stupa at Sanchi and the railing of the Bharhut Stupa, belonging to the first and second century B.C. respectively.

In the gradual changes implemented to enhance the diversified approaches in the fossil botany, it is to the credit of Dr Vishnu-Mittre to have revived the scope of archaeobotanical studies at the Institute, as visualized by the Founder. Initially he joined the Institute as a research scholar in 1951 and devoted to the research in Mesozoic Palaeobotany. He was awarded Ph.D. Degree in 1957 and his work stood the best of time. During his deputation for higher studies abroad, he joined Emmanuel College at Cambridge for specialization in Quaternary palynology under Sir Harry Godwin, and got his second Ph.D. Degree in 1960. Returning to India, he organized the Department of Quaternary Palynology and co-ordinated the diverse disciplines, including the archaeobotany. His first paper on the plant remains from Navdatoli-Maheshwar in 1961, marked again the furtherance of the archaeological work in the research activities of the Institute, as initially visualized by Prof Birbal Sahni. Well known for the palynological work the Quaternary Department under the superintendence of Dr Vishnu-Mittre, commendably generated a mass of data on the past vegetation, climate and land use associated with several forms of human activity. Changes in the vegetation, mimicking the effects of desiccation contributed swimmingly on the cultural perspectives. It is needless here to elaborate on the momentous contribution of Dr Gurdeep Singh (1971, 1974) on the environment of the Indus Valley Civilization, in the context of Post-Glacial climate and Ecological Studies in North-west India. This land-mark work is reckoned with, in the archaeological world. Birbal Sahni Institute of Palaeobotany has made major contributions to palaeoenvironmental studies critical for prehistoric archaeology. Prof George Rapp Jr. of the University of Minnesota visited India in 1983 as the Ford Foundation Consultant, on "Archaeological Science in India" and visited some of the important centres of archaeological studies in the country. He also met with several Indian archaeologists and scientists engaged in research relevant to archaeology. Regarding the Birbal Sahni Institute of Palaeobotany he wrote "Dr Vishnu-Mittre has developed Indian palynology (pollen analysis) to the point where it ranks among the best in the world. Of equal importance is the excellent dating laboratory and is now expanding into other radiogenic dating techniques". Archaeology is as much an international science as any other, and this Institute has its commitment for this discipline, as imagined by the thought highly of Prof Sahni.

It was generally a trend in the past that some archaeologists used to send a few plant remains incidentally encountered by them to a botanist, for identification. Remains of crop plants from over a dozen sites brought out an excitement among archaeologists and centrality of subsistence in time and space in the writings of Dr Vishnu-Mittre, particularly his paper in 1974, secured the scope of such studies in the Indian prehistory. The Institute became known all over as a centre of archaeobotanical studies. Keeping in view, the progress, which was, however, considerably less satisfactory had remained the comprehensive site-reports. The reason was that the collaborating botanists were not given access to digested site-data. The recovery of plant remains was confined to just small areas of the production levels in archaeological sites. As a result, the potentially rich sites also yielded much little to be convincing. The need of an active participation of a botanist in excavations was ultimately realized in 1983, for more efficient means of collecting the plant remains. Seeking active collaboration of field archaeologists and generating data systematically through the course of excavations, a major breakthrough was made. Our information from a number of sites in northern India has consequently contributed to a much broader understanding of the ways in which pre- and proto-historic people may have exploited plants in their environment, and also as providing some clues about ancient agricultural systems. Radiocarbon dating at the Institute significantly contributed to make chronological frame-work of agricultural developments in the archaeological context. Now, some of the informations from a few settlements of Harappan culture in Punjab and Haryana and of Neolithic-Chalcolithic cultures in the Ganga Plain, have contributed to a much broader understanding of the ways in which ancient people exploited the plants in their environment, during the time-bracket of past 5000 years. The vast data seem to offer not only a point of departure from the earlier traditional picture, but also could be evaluated about the diffusionary trends of agriculture. The sign of the substantial change may be regarded to have been underway in the region of Ganga Plain during Neolithic

times before 2000 B.C. Diffusion of wheat, barley, lentil, pea, etc., which were the crops of Harappans in north-western India, is worthwhile to draw meaningful conclusion in terms of direct or indirect communication of settlers in the rice-growing Ganga Plain with the communities cultivating Harappan crops. We need to know what sort of cultural network led the widespread diffusion of these crops and how it took place at such an early dates; one gets the impression that it was the development in the Middle Ganga Plain, in no small part, owing to the fact that there must have been contiguous ecological zones right from the north-western India where highly advanced Harappans were flourishing, up to the regions of Bihar.

These zones were exploited agriculturally in different ways and evolved through different cultural stages, and their geographical and cultural closeness inevitably allowed the varied subsistence economy to interact and interstimulate each other (Saraswat, 2004). This supposition seeks further support by the records of rice cultivation during 3rd millennium BC, in the Harappan economy in Haryana and Punjab (Saraswat & Pokharia, 2003). The botanical approach at the Institute, in spite of some lacunae in its own right, has fetched for an enquiry from archaeologists and cultural geographers, particularly those interested in long-term cultural diffusion and trans-regional adaptations, to conceptualize the problems, mechanism of early cultural transmission between the Harappan Zone in northwestern region and the rice-growing Middle Ganga Plain.

The Institute is heading to bring an increasing swing towards generating a mass of data, critical to the varied interests of archaeologists, anthropologists, botanists and cultural historians, in the ecological and economical aspects of human past, by tinkering with priori models of exploitive relationship of early man with the plants in preferred ecological situations. Viewing domestication and the early agriculture, traces of fully domesticated rice have been found at an early site Lahuradewa in Sant Kabir Nagar District of U.P. The finds have reliably been dated to 7,532 yrs BP: cal. 8,259 BP, demonstrated in the present conference. The scope of further intensive work in the vast tracts of Ganga Valley, viewing the domestication and beginning of agriculture is being realized at present. Botanical aspect in archaeology at Birbal Sahni Institute of Palaeobotany is no longer peripheral but of considerable significance to many unresolved problems of human past. The most fateful and portentous development in the whole story of man was his learning how to produce food by intention, instead of harvesting it from natural production. The working avenues in this line of archaeology are immediate requirements. Where a vision is limited, action is circumscribed. The novelty of such integrated research work, as visualized by Prof Birbal Sahni, is at present evinced up to know by botanists and archaeologists at the executive and programmatic levels in the future excavation campaigns.

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Coal Petrology in Relevance to Coal Bed Methane Exploration

Coal is known to contain vast reserves of methane (CH_4) gas that can be utilized as a commercial energy resource to solve energy crisis. Methane generated and reservoired in coal seams is referred to as coal bed methane (abbreviation CBM). Exploitation of this gaseous hydrocarbon from coal seams and its utilization for energy needs in USA opened up a new vista for energy hungry countries having enormous coal reserves. Major coal producing countries like China, Germany, Poland, Russia (USSR) and UK (Great Britain) have paid attentions to explore this new unconventional energy resource.

There seems to be no doubt about the *in-situ* availability of large quantity of CBM in India having huge coal reserves (204 BT established) distributed in Permian Gondwana and Tertiary basins. According to present reports, recoverable CBM reserves are estimated at 800 BCM with gas production potential of 105 MCM a day over a period of twenty years from 20,000 sq km area identified as prospective for CBM exploration. In the country, first systematic study on the prospects of CBM was carried out at KDM Institute of Petroleum Exploration, Dehradun in 1983. Efforts to exploit CBM in India are continued ever since Essar, a Private Oil Company, initiated the work in 1990. Oil and Natural Gas Corporation in 1997 succeeded in flowing CBM for the first time in Parbatpur Block of Jharia Coalfield (Damodar Basin).

Following the decisions of the Cabinet Committee on Economic Affairs (in July 1997), the Ministry of Petroleum and Natural Gas (as Administrative Ministry for CBM) in consultation with Ministry of Coal has formulated a CBM policy, in view of the importance that has been attached globally to this precious energy source. The Directorate General of Hydrocarbons (New Delhi) was nominated as nodal agency to promote the development of CBM exploration and production in the country. So far, they have identified and awarded 16 coal-housing blocks prospective for methane gas in bidding round 1st and 2nd (starting in 2001) to GEECL, ONGC, CIL, OIL, RIL, and their consortiums from where production of this clean source of energy in good amount is expected.

There seems to be no dearth of interest in the area of CBM exploitation, yet it has not reached the logical end in India even after several years of efforts. The reasons for slow pace of development may be assigned to:

Major parts of Permian Gondwana coals (up to a depth of 300 m) being far below the threshold of methane generation,

Independent working of Private Sectors that results in unawareness to the field experiences and problems faced by others dealing with the same aspect,

Non-availability of suitable technologies for cost-effective production and distribution of CBM, and

Insufficient CBM related data on various seams of coal/lignite basins.

Generation of data related to CBM on coals of various basins is extremely essential for successful recovery of *in situ* methane gas from coal beds. This can be substantially obtained through petrological investigations, viz., rank, micro-constituents composition, nature of fractures and joints (cleat patterns), associated minerals, etc. on coals. Before highlighting the importance of coal petrological studies in generating CBM data on coals, a brief mention about coal is relevant here because understanding coal is very essential, which is solely responsible for all methane generating and producing properties.

Coal—is formed from ancient plants existing million of years ago, in several years under specific conditions of Eh, pH, temperature, moisture, etc. Vegetal matter from plants (stems, leaves, roots, spores-pollen, cuticles, resin/wax, seeds, algae, fungi, bacteria, etc.) through the process of coalification becomes consolidated and carbonized, loosing its original colours, morphology and chemical constituents. Plant parts convert into microscopically recognizable micro-constituents termed "macerals" in petrological (coal) parlance. Each maceral originating from particular plant part under specific conditions and following its own path of coalification, therefore indicates the type of source material and environmental conditions under which coal has formed.

Macerals, the basic unit of coal, (like 'minerals' in a rock) are responsible for all types of variations in coal characteristics. On the basis of origin and chemical composition macerals are categorized into-

oxygen-rich Vitrinite (medium reflectance), hydrogen-rich Liptinite (low reflectance) and relatively carbon-rich Inertinite (high reflectance) groups.

Coal Petrology—mainly deals with the optical and chemical properties of macerals incorporating reflectivity measurements (for rank determination, $R_{o\ max}$) and qualitative and quantitative estimation of macerals under normal incident (546 nm wavelength) and fluorescence (380-420 nm wavelength) modes. The estimates respectively help to know type and frequency of macerals, and thus the organic composition of coal and associated mineral matters which is important for ascertaining many CBM related properties, like methane generation and retention capacities and producibility, etc.

Inherent properties enable certain macerals to generate methane gas while provide other macerals the capacities to retain and absorb-desorb the gas. Rank, determined through reflectivity measurements on maceral vitrinite, ascertains the maturation level of coal, which has significance in pore structure development and thermal cracking of kerogen and thus in generation and retention of gas. Beside this, nature of micro cleats and associated mineral matters in coal are important part of petrological studies, which influence CBM reproducibility. Evidently, maceral study is of immense importance to understand coal and in turn the CBM properties. Petrological studies besides providing an insight to coal, which acts as both the producer and reservoir for methane gas, helps to understand influence of petrological properties on CBM potentiality of coal.

Influence of Petrological Properties

1. In generation of methane

Methane gas, during the transformation of vegetal matter into coal, is generated in two ways:

i) by biological processes involving metabolic activities of biological agencies—*biogenic methane*, and

ii) by thermal processes incorporating temperature induced catagenetic and metagenetic processes—*thermogenic methane*, where thermal cracking of kerogen fraction or low boiling point hydrocarbons or free lipid substances in coal occurs.

Isotopic studies have indicated that biological activities are essential for biogenic generation of methane at shallow depths (<10 m, temperature 50-80ºC). Bulk methane, however is generated during catagenetic (80-150ºC) and metagenetic (150-200ºC) stage of coalification with maximum generation at the boundary between high-medium volatile bituminous and low volatile bituminous coals, i.e., bulk methane generates when coal attains high maturation level indicating the rank values between 1.10 and 1.40% $R_{o\ max}$.

Lipid content in coal is actually responsible for the amount of methane generated during thermogenetic processes. Higher is the lipid contents, greater is the amount of gas generated. Petrography of coal has ascertained that hydrogen-rich vegetal matter, like spores-pollen, cuticles, suberins, resins, waxes, algal matters, etc. participating in coal formation are precursors for lipid. Lipid-rich vegetal matter is categorized as the liptinite group of macerals in coals/lignites. Irradiated with high-energy ultra-violet (UV) or blue light waves they tend to fluoresce with different colours and intensities, and are easily identifiable under fluorescence mode. Quantitative estimation of liptinite macerals provides information on lipid content in coal, the raw material for methane. Generation of methane through thermal cracking of lipid is not possible unless the coal has attained a certain rank. Methane gas generating potential of a coal therefore can be evaluated by quantitative estimation of liptinite contents and rank.

2. In retention and production of methane

In contrast to natural gases, which remain in free state and are reservoired in other rocks, methane from coal is reservoired in coal beds itself either in a free or sorbed phase in pore spaces of coal. It is stored as adsorbed molecule on internal surfaces or as absorbed within the molecular structure of coals. The gas also remains as free in joints, fractures and cleats, and as dissolved in ground water within the coal seam(s). Adsorption predominantly occurs on the walls of micro-pores and hence adsorption capacity is closely related to pore structure that develops during coalification. Coalification stage, i.e., rank attained by coal has significance in assessing adsorption capacity of coal. Pore structure development increases with the increase in rank. Three types of pores occur in coal-macropores (>50 nm), mesopores (50-2 nm) and micropores (<2 nm). Rank of coal is, therefore critical in understanding how gas content may vary in relation to pore structure and its distribution. Highest sorption capacity is observed between rank

values 0.90-1.10% decreasing at 1.10-1.40% $R_{o\,max}$ and increasing again beyond $R_{o\,max}$ value of 1.40%.

In addition to rank, adsorption capacity is also influenced by vitrinite and inertinite macerals whose precursors are similar plant parts, however developed in different environmental conditions. The studies have indicated that vitrinite-rich bright coals have greater adsorption capacity than their inertinite-rich dull equivalents. On the contrary, the former type have slowest desorption capacity and the latter have highest. Highest adsorption and slowest desorption capacities of vitrinite-rich coal is assignable to high surface area due to well-developed micropore structure in vitrinite macerals. Available information indicates that inertinite is more macroporous and less microporous than their rank equivalent vitrinite and hence posses reverse sorption capacities than vitrinite. Macroporosity in vitrinite macerals decreases with increasing rank of coal, whereas decreases in inertinite macerals. It is certain that amount of vitrinite and inertinite macerals together with rank is significant in controlling sorption behaviour of coal.

The study of cleats or natural fractures in coal is another important parameter of coal petrography. Cleats may be regarded as a natural network of fine pipelines in coal, which controls the flow of gas (methane). Cleats, therefore impart permeability to coal. Mega cleats are observed in field itself, whereas micro cleats are studied under petrographic microscope for various features, viz., length and breadth, pattern of occurrence, spacing, mineral filling, etc. These features provide valuable information on availability of free spaces for methane to flow. It is established that coals having permeability of <1 md (millidarcy) are not promising for methane production. Despite the high rank and appropriate maceral composition coals may not be able to produce methane if impermeable.

Coal petrology also provides information on minerals in coal, which intimately mix during the early stages of coal formation (syngenetic) or get associated at late diagenetic stages (epigenetic). Type and pattern of occurrence, viz., discrete, disseminated, in filled (in cracks, cleats, cells, etc.) provide valuable information on permeability of coal that may get reduced with the mineral filled spaces, cleats, fissures, etc.

Concluding Remarks—In order to understand the interplay of rank and macerals, which are two extremely important parameters, to evaluate CBM properties a detailed petrological study should be made on some selected coals. The information thus obtained should be implied on other coals to generate useful CBM related information and to standardize the data. Collaboration between CBM Industries and Coal Petrologists is the need of hour in order to generate important CBM data on coals. A joint effort by all, i.e., Government and Private Sectors, Coal Industries and Scientists will pave way for the successful recovery of coal bed methane in India. Besides, deeper parts of Gondwana and Tertiary coal basins should be explored and suitable technologies for cost-effective production and distribution of this (CBM) eco-friendly non-conventional source of energy should be developed.

Alpana Singh and B.D. Singh

Vegetation *vis-a-vis* climate change, Central Narmada Valley

The Narmada river of Central India flows along an E-W lineament bounded by Vindhyans in the north and Satpuras to the south. The Precambrian Vindhyans and Cretaceous Deccan Traps form the basement of the extensively developed Quaternary deposits of the Narmada River Valley. These are widely known for their rich mammalian fauna and stone tool assemblages. Quaternary deposits have been divided into seven formations, namely Pilikarar, Dhansi, Surajkund, Baneta, Hirdipur, Bauras and Ramanagar based on the order of superposition, erosional unconformity, nature of sediments, etc. Samples were collected from the cliff sections from Baneta, Surajkund and Dhansi formations. A broad inference of vegetation *vis-a-vis* climate change around this area have been drawn on the basis of pollen/spore assemblages recovered from the sediments of three formations.

Dhansi Formation

The pollen proxy record obtained has revealed that the area in the vicinity of Dhansi Formation was covered with sparse grassland vegetation, chiefly constituted of the members of Poaceae, Asteraceae, Chenopodiaceae and *Artemisia* under


Symplocos


Terminalia


Chenopodium

arid climate condition during the course of sediment deposition. Fern and their allies might have occupied moist or damp habitats along the ephimeral lake bed as indicated by the presence of good number of monolete and trilete spores in the sediments.

Surajkund Formation

On the basis of pollen/spores recovered in all the samples it could be inferred that during 24,000 to 20,000 Yr BP (SF-16, BS 2,240 date is 24,280±390 Yr BP) the area might have covered with open vegetation constituted of grasses, Chenopodiaceae/ Amaranthaceae and Asteraceae along with sparsely distributed trees viz., *Symplocos, Terminalia, Artemesia* and *Holoptelea*. The overall vegetation assemblage is suggestive for the prevalence of cool and dry climate regime during the period of sediment accumulation. The record of marshy elements such as sedges (Cyperaceae) and *Polygonum* together with the aquatic elements *Potamogeton* and *Typha* and algal remains such as *Spirogyra* and *Zygnema*. denotes the existence of water bodies/ponds /lakes in the close proximity of the site of investigation. This vegetation scenario and corresponding climatic event is equivalent to the Last Glacial Maximum (LGM) episode which has been globally witnessed between 18,000 to 22,000 Yr BP.

Baneta Formation

The palynological assemblage consists of *Lemna, Artemesia, Terminalia, Pongamia, Mimosa, Trapa, Potamogeton, Chenopodium*, Solanaceae, *Polygonum* Convolvulaceae, Poaceae, Fern spores (Trilete and monolete), Zygospores of Zygnema, *Tetrapola* and fungal spores. The samples analysed (BF 3 & 4, BS 2,278) from this formation dated as 9,701 Yr BP.

During Baneta Formation, around 10K, the area might have covered with dry deciduous forest represented by *Terminalia, Mimosa, Pongamia* and *Artemesia* under amelioration of climate when precipitation was some what higher than the earlier formations. The presence of aquatic taxa viz., *Potamogeton* and frequent presence of algal spores also indicate that the lake level was higher at that time.

M. R. Rao, M. S. Chauhan, BSIP and Rajeev Patnaik, GD,PU

Conservation of photographs

Museums preserve photographs, negatives, slides, cassettes, etc. Therefore the information regarding the preservation and care of photographic materials are much useful to the curators or collectors of such materials.

Deterioration of photographs— The materials of photograph are very complex, having several components like support, binding medium and photosensitive image forming chemicals, which may react in different ways to various factors of deterioration. The common deterioration noticed in photograph are yellowing stains, separation of emulsion, insect attack, fungal attack, scratches, finger prints folds, etc. photographs fixed on moist walls have been affected by fungi.

Conservation of photographs—In the case of glass negative, due to age the emulsion becomes brittle, cracks and falls off at slightest shock or touch. Since gelatin is easily prone to damage by water, the negative or photographs should never be touched on the face, but should be held at the edges. Photographs or negative should be never kept together as they stick to each other in a humid condition and it is very difficult to separate them without damage. If the humidity is very low, the gelatin portion starts cracking. Micro-organisms like fungi affect the photographs at humid environment. Silver fish eats the gelatin as well as paper. It is an irreparable loss. While framing photographs the glass should never touch the photograph but spacer should be provided between the glass and the photograph. In case of accidental water soaking, the photograph should be dried without any blotting paper. The surface should be cleaned with a soft brush. The photographs are kept inside oil covers and stacked in a cabinet, which is kept in an air-conditioned room. Colour films, being very colour fugitive, need low temperature for preservation. The safest storage environment for all photographic materials, whether colour or black and white is a temperature as low as possible, preferably below freezing, and a relative humidity of around 30%.

Sanjai Kumar Singh

Participation of the Staff in Scientific/Technical Meets

Asha Gupta

Visited Sierra Nevada and National Park during associated field excursions of XI International Palynological Congress, Granada (Spain) held in July 2004. Also visited Alhambra's Museum, Museum of Fine Arts and Generalife Palace. Participated in the XI International Palynological Congress held at Granada, Spain on July 04-09, 2004.

A. Bhattacharyya & B. Sekar

Participated in the Marine Archaeology (BGI) Session of Joint AOGS 1st Annual Meeting and APHW Second Conference held at Singapore on July 05-09, 2004.

Joint Asia Oceania Geosciences Society 1st Meeting and Asia Pacific Hydrology & Water Resources 2nd Conference held at Singapore from July 5-9, 2004.

S. K. Bera

National Workshop on Indian Antarctic Research Programme: Achievements of 23rd and Planning for 24th Antarctic Expedition held at NCAOR, Goa from July 19-20, 2004.

Vijaya

Participated in the 32nd International Geological Congress held at Florence, Italy, on August 20-28, 2004.

Y. P. Singh

Attended the Tech-ed Event of Microsoft held at New Delhi from August 25-27, 2004.

Supriya Chakraborty & B. Sekar

Workshop User Interaction Meeting on Accelerator Mass Spectrometry of Radiocarbon held at Bhubaneshwar from August 26-27, 2004.

Asha Khandelwal & A. Rajanikanth

National Conference on Environmental Ethics for Sustainable Development held at Mumbai from September 1-2, 2004.

Rajni Tewari

Attended Hindi Workshop organised by *Nagar Rajbhasha Karyanvayan Samiti* at CDRI, Lucknow during September 1-2, 2004.

R. R. Yadav & Bhasha Dubey

Indo-EU Workshop on Climate Change and Natural Disasters held at Hyderabad from September 6-10, 2004.

Dhirendra Sharma & Avanish Kumar

Attended Short Term Training in Libsys Software organized by Libsys Corporation held at Gurgaon from September 13-23, 2004.

Rakesh Saxena

Attended Workshop on Academia-Industry Interface Seminar organized by Petrotech Society and held at INSA, New Delhi during September 17-19, 2004.

Asha Khandelwal & A. Rajanikanth

Workshop on Environmental Management and Pollution Control Awareness held at IEM, Lucknow on September 18, 2004.

B. K. Misra, Rakesh Saxena, O. S. Sarate, B. D. Singh & Anupam Sharma

Participated in the Seminar on Advances in FTIR Instrumentation and its Applications organized by Micro Device Metrohm Limited at Hotel Taj Residency, Lucknow on September 22, 2004.

A. K. Ghosh

Attended 2nd Foundation Training Programme for Scientists and Technologists held at Indian Institute of Public Administration, New Delhi, sponsored by DST during July 5-September 24, 2004. Also participated in Review/Brain Storming Session-DST Training organised by IIPA New Delhi and held at Heritage Village, Manesar, New Gurgaon during October 23-24, 2004.

M. R. Rao

National Workshop on Sequence Stratigraphy held at Bangalore from November 4-6, 2004.

A. Rajanikanth & Rajni Tewari

European Plant Taphonomy Meeting-2004 held at National Museum of Natural History, Naturalis, Leiden, The Netherlands from November 12-13, 2004.

Manoj Shukla & J. S. Guleria

Attended 1st NIAS-DST Course for Senior

Scientists- Administrators on Multidisciplinary Perspective in Science and Technology held at National Institute of Advanced Studies, Bangalore during November 15-27, 2004.

A. Bhattacharyya, Anupam Sharma & Vandana Prasad

Participated in DST sponsored Training Programme on Fluvial Systems held at Department of Geology, MS University, Baroda from November 16-25, 2004.

Mukund Sharma

IGCP-440 National Workshop on Rodinia Assembly and Break-up held at Thiruvananthapuram on November 19, 2004.

P. S. Katiyar & Y. P. Singh

Attended Open Source Technology and Linux Seminar organized by UPTEC Lucknow on November 19, 2004.

C. M. Nautiyal

Attended 52nd and 53rd Meetings of *NARAKAS* held at CDRI, Lucknow in August, 2004 and in February, 2005 respectively.

Attended National Seminar on Scientific Attitude: Role of Media organised by Rajasthan University, Jaipur and NCSTC/ DST during November 29-30, 2004.

Manoj Shukla

Participated in National Working Group Meeting IGCP-493 'Rise and Fall of Vendian Biota' held at GSI, Kolkata on December 6, 2004.

Anupam Sharma

Participated and presented a project proposal "Quaternary sedimentary records of Mahi River Basin, Mainland Gujarat: A multidisciplinary approach" in the DST sponsored Shallow Sub Surface Meeting held at JNU, New Delhi during December 17-18, 2004.

A. K. Srivastava, O. S. Sarate & B. D. Mandaokar

National Conference on Recent Trends in Botany held at Chandrapur, Maharashtra from December 19-20, 2004.

Ram Awatar

National Seminar on Sedimentary Resources and Environments held at Annamalai University, Annamalainagar on December 20-22, 2004.

A. Bhattacharyya

Attended the Group Monitoring Meeting held at the University of Madras, Chennai from December 22-23, 2004 in connection with the review of progress of the sponsored project Analysis of climatic changes in North-East India during last several thousand years using pollen and tree-ring data.

Chanchala Srivastava, M. S. Chauhan, Vandana Prasad, A. K. Pokharia & B. Sekar

Joint Annual Conference: Indian Archaeological Society XXXVIII, Indian Society for Prehistoric and Quaternary Studies XXXII and Indian History and Culture Society XXVIII and National Seminar on the Archaeology of the Ganga Plain held at Lucknow from December 28-31, 2004.

Ram Awatar & D. C. Saini

XIV Annual Conference of Indian Association for Angiosperm Taxonomy held at Thiruvananthapuram on December 29-31, 2004.

Mukund Sharma

Participated in DST sponsored SERC Winter School on Geological Mapping of Sedimentary Terrain in Cuddapah Basin, Kurnool area (AP) organised by GSI, Training Institute, Hyderabad during January 3-29, 2005.

Santosh Kumar Shah

Participated in the First Prof Ananthakrishnan Memorial Conference on atmospheric Science, Climate Change and Environmental Studies, held at IITM, Pune on January 18-19, 2005.

Participated in the SERC School on "Concepts in Quaternary Geology" held at Indian Institute of Technology, Kanpur on 27th March-16th April, 2005.

Rakesh Saxena

National Seminar on Geoscience and Environment (NASGEN) held at Chennai from January 27-28, 2005.

Asha Khandelwal

13th National Conference on Aerobiology held at Nagpur Mumbai from January 31-February 2, 2005.

A. Rajanikanth

1st J&K State Science Congress held at Jammu from February 7-9 2005.

J. S. Guleria, Mahesh Prasad, Rajni Tewari, Madhabi Chakraborty & E. G. Khare

International Conference on Modern Trends in Plant Sciences with Special Reference to the Role of Biodiversity in Conservation (ICPSBC-05) held at Amravati (Maharashtra) from February 17-20, 2005.

चन्द्र मोहन नौटियाल और मुकुंद शर्मा

नगर राजभाषा कार्यान्वयन समिति, लखनऊ' की 53वीं अर्द्धवार्षिक बैठक, केन्द्रीय औषधि अनुसंधान संस्थान, लखनऊ दिनांक 22 फरवरी, 2005।

C. M. Nautiyal, Ram Awatar & D. C. Saini

Paryavaran, Swasthyay, Jaiv evam Suchna Prodogiki: Nutan Sopan- HIMVAS-2005, 1st International Scientific Conference through Hindi medium held at ITRC, Lucknow from February 28-March 2, 2005.

D. C. Saini

Visited Institute of Botany, Chinese Academy of Sciences, Beijing, China for discussion regarding a New Joint Project on comparison of Tropical forest in China and India, from March 10 to the end of April, 2005.

V. Nirmala

Workshop on "Implementation of Apprentices Act 1961" held at Jai Shanker Prasad Seminar Hall, Rai Uma Nath Bali Auditorium, Kaisar Bagh, Lucknow on March 11, 2005.

Supriya Chakraborty

Deputed to give courses on Stable Isotope Systematics and Radiocarbon Geochronology at the SERC School on "Concepts in Quaternary Geology" held at IIT, Kanpur during March 27-April 16, 2005.

Kamal Jeet Singh

Deputed to visit Cardiff, U.K. under INSA—Royal Society Exchange Programme of the Indian National Science Academy for the year 2004-2005, for a period of three months with effect from 29th March, 2005.

Samir Sarkar

Deputed to visit Brno, Czech Republic under INSA-ASCR Exchange Programme of the Indian National Science Academy for the year 2004-2005, for a period of three months with effect from 30th March, 2005.

N. C. Mehrotra & Anjum Farooqui

Workshop on "Continental Shelves during the Last Glacial Cycle Knowledge and Applications IGCP-464", held at Geological Survey of India, Marine Wing, Visakhapatnam on 30-31 March, 2005.

Jyoti Sharma

Attended the "SERC School on Concepts in Quaternary Geology" held at IIT Kanpur on April 06-07, 2005.

R. R. Yadav

Attended Seminar on "Disaster Management : Role of Meteorology and allied disciplines" held at Ranchi on April 08-09, 2005.

चन्द्र मोहन नौटियाल

'विज्ञान परिषद' प्रयाग द्वारा विज्ञान परिषद सभागार, इलाहाबाद में आयोजित एक राष्ट्रीय कार्यशाला 'हिन्दी विज्ञान पत्रकारिता : वर्तमान तथा भावी परिदृश्य' में दिनांक 11-12 अप्रैल, 2005 को भाग लिया।

B. D. Singh

Participated in the International Seminar on Coal Sciences & Technology Emerging Global Dimensions- GLOBAL-2005 held at Vigyan Bhawan, New Delhi from April 12-13, 2005.

J. S. Guleria

Participated in the "Recent Advances and Perspective Challenges in Indian Non-Marine Late Cretaceous" held at Nagpur on April 23-25, 2005.

Archana Tripathi

Attended the 4th Meeting of the Subject Expert Committee (SEC) on Earth on Atmospheric Sciences for Women Scientists Scheme (WOS-A) held at National Institute of Oceanography (NIO), Dona Paula, Goa on May 02, 2005.

P. S. Katiyar & Y. P. Singh

Participated in the National Conference on "Current Trends in Computer Technology &

Bioinformatics" (CONMICRO-2005) held at Lucknow on May 14-15, 2005.

Subodh Kumar

Attended the Summer Training Programme in Electron Microscopy held at Department of AIIMS, New Delhi from May 16 to June 30, 2005.

Madhavendra Singh & Syed Rashid Ali

Participated in the Training Programme on Bioinformatics : Tools & Applications held at Bioinformatics Centre, Lucknow on May 18-20, 2005.

Vinod K. Singh

Attended a training programme on Master Resource Persons Training sponsored by the Department of Science & Technology (DST), Government of India, which was conducted by Geological Survey of India Training Institute (GSITI) Hyderabad held at Shimla on June 01-03, 2005.

A. Bhattacharyya

Participated in the IRSO-GBP SWG (Palaeoclimates) Meeting held at Physical Research Laboratory, Ahmedabad on June 13, 2005 .

N. C. Mehrotra & Asha Khandelwal

Participated in the AOGS-2005 2nd Asia Oceania Geosciences Society's Annual Meeting held at Singapore on June 20-24, 2005.

सुरेश चन्द्र बाजपेई, रतन लाल मेहरा, मुरुकन पिल्लै

नगर राजभाषा कार्यान्वयन समिति, लखनऊ' द्वारा केन्द्रीय औषधि अनुसंधान संस्थान, लखनऊ में दिनांक 29-30 जून, 2005 को आयोजित तीन सत्रों की 'दो-दिवसीय सामूहिक हिन्दी कार्यशाला' में भाग लिया।

A view of Independence Day Celebrations 2004

Conference and Meeting Reports

National Conference on Environmental Ethics for Sustainable Development

The National Conference on Environmental Ethics for Sustainable Development was organized by K. J. Somaiya College of Arts and Commerce, Vidyavihar, Mumbai.

The Conference was organized to discuss various aspects of progress and development which are heavily anthropocentric and affect quality of air, water soil, plants and animals. The life supporting systems are unscrupulously consumed and damaged which ultimately deteriorate ecocentric supports. Application of science and technology to nature has a far reaching consequence. This demands a new environmental ethics for all development strategies. An interdisciplinary approach drawing experts from different spheres of knowledge was envisaged and the conference attracted a number of participants from different parts of the country.

The meet was categorized into four sessions—science and technology in relation to environmental crisis, Reformation of human centered/anthropocentric Socioeconomic strategies with bio/ecocentric perspective; Relevance of traditional philosophical beliefs and values for sustainable development (Cosmocentric para-digms) and positive and preventive actions for sustainable development.

Discussions on environmental ethics and sustainable development—A scientific and technological reappraisal, environmental manage-ment, surface transport alignment projects, rock-water regimes and biomedical waste management came up with novel ideas. Aspects like environmental ethics, past ecosystems and extinctions, biodiversity, human angle of scientific progress, sustainable agriculture and others attracted much attention.

The presentation entitled—Vestiges of vanquished plants-A reminder to Modern Man highlighted past phytoevents and interaction with climate through time. Role of plant fossil signatures reflecting past climatic changes was discussed drawing evidences from various plant fossil records.

Attended different sessions and participated in the discussion on Biodiversity, Human angle of science, value importance in ordered societies, importance of Deep ecology and related topics.

The deliberations came up with following recommendations

(1) Paradigm shift in recent years to sustain environment and its components should be understood to evaluate data available on environmental issues.
(2) Anthropogenic factors play a pivotal role in assessing environmental changes.
(3) There is a greater need to work for education of citizens through scientific awareness programmes.
(4) Holistic approach should be adapted to understand various components of Bio-eco-anthropo-cosmo centric ethics.
(5) Biological evidences both past and present including impact of environmental changes should be integrated to formulating eco-friendly policies.
(6) Efforts should be put in to conserve bio reserves through societal participation.

The conference attracted experts /scholars from multiple fields like education, science, technology, sociology, commerce, government/non-governmental departments and presence of Shri Sundarlal Bahuguna from Garhwal, Uttaranchal provided a platform to understand ground realities of mass movements and their impact on policy making. Various social, legal and ethical issues on sustainable development for better tomorrow were focused during the deliberations.

Asha Khandelwal & A. Rajanikanth

European Plant Taphonomy Meeting 2004

European Plant Taphonomy Meeting 2004 was held during November 12-13, 2004. It was organised by National Museum of Natural History, Naturalis, Leiden, The Netherlands.The European Plant Taphonomy Meeting 2004 was focused on the theme "What ecosystems can we identify

through the taphonomy of floras and what niche did what plants occupy"?

The deliberations were conducted in an informal way by assembling small group of scientists inclined to examine newer trends in fossil plant research. The role of plant fossils in identifying palaeo-ecosystems has been a subject of much debate. During the course of meeting scientists from The Netherlands, Germany, Czech Republic, Austria, India, Italy and United Kingdom took active part in expressing their views and presented their data highlighting abiotic and biotic factors responsible for maintaining ecosystem balance. Since plants are reliable environmental indicators, their utility in interpreting palaeoenvironments was stressed. The contribution to the meet entitled- "Mesozoic terrestrial plant life of Pranhita-Godavari Basin, India" highlighted role of phytofossil remains like leaf, wood, pollen and associated faunal data in deriving ecosystem type. Emphasis on integrated analysis was made drawing examples from Indian Mesozoic floras. A need for ecological categori-zation was re-emphasized and highlighted relevance of holistic evaluation of fossil floras for ecological inferences. Distribution of Gymnosperm dominated floras and paucity of flowering plant evidences in the Indian sedimentary basins was subject of post-presentation discussions. Use of leaf and wood fossils for climatic interpretations too had attracted much attention.

Besides, other important research inputs include -Lower Permian flora of the Jambi Province, Sumatra, Indonesia; Cretaceous fungal flora, Holland; Reconstruction of Middle Triassic palaeoenvironments/palaeoclimate of N-Italy using plant deposits; *In situ* peat swamp forests of Czech Republic; Middle Westphalian plant associations of continental basins of Bohemia, Czech Republic; Significance of plant cuticles in palaeoecology using Indian data; Late Oligocene flora of Saxony, Germany; Plant associations of Mengkarang Formation of Sumatra; Conifers and associated fungi from Maastrichtian and Dicroidium flora from the Permian of Saudi Arabia. During the presentations and post presentation discussions on various aspects of fossil preservation, role of facies, sedimentary sub-environments, and ecological models were proved beneficial in enriching knowledge on Taphonomy and Palaeoecology.

Summary of the recommendations—The European Plant Taphonomy Meeting 2004 held at Naturalis, Leiden, The Netherlands was attended by experts on this new science and thought provoking discussions lead to constructive guide lines. A general consensus on the following aspects has been reached:

Fossil plant parts are dependable ecological indicators. There is a need to build up data base of fossil plant parts drawn from different geological horizons.

Concerted efforts should be made to integrate data on various preservation types like compressions, petrifactions and associated organic remains.

Basinal floral interpretations should be drawn taking help from palaeontological, geological, stratigraphical and palaeoecological evidences.

Congregation of workers in the field of Taphonomy and Palaeoecology should work out modalities of implementing models made with the help of database available.

New inputs from the field should be augmented with lab studies and multidisciplinary approaches should be adapted.

Newer trends in climatic research utilizing fossil cuticles, organic matter and palynodebris should be encouraged.

During the course of stay in the Netherlands the following observations were made on the research activities carried out by different organizations/ museums/herbaria visited:

Naturalis, Leiden, The Netherlands

The activities were focused on research and collection activities specifically dealing with the Dutch geology including the adjacent North Sea Basin and surrounding border areas. Geological history of the Netherlands is traced.

As part of this program book series, provisionally called Geologie van Nederland were introduced for reference.

The inventory, review and description of the Westphalian palaeobotanical fossils of Southern Limburg (Jongmans Collection) was being carried out.

The development of the Plio-Pleistocene malacofauna in the south western Netherlands from the Deltadienst boreholes was studied.

The fossil shells from the Dutch beaches and estuaries were the main theme of research.

The Naturalis is an expert centre for the knowledge of the natural history of the Netherlands. A huge database of the distribution

of invertebrates in the Netherlands was also maintained.

Books like "Nederlandse Fauna" and "Geologie van Nederland" are important reference books.

A research programme concentrating on the Central Indo-Pacific, the transition zone between the Indian Ocean and the Pacific Ocean, comprising Thailand, Malaysia, Indonesia, Philippines, Papua New Guinea and Solomon Islands which have richest coastal fauna including the benthos, (up to 200 meters continental shelf) is significant to note. This deals with taxonomic, the other biogeographic aspects and phylogenetic reconstructions. Knowledge acquired from these studies is applied in coastal management and in deriving palaeoecology of extinct species.

Marine biogeography of Southeast Asia is studied using models in which sea level fluctuations are the driving force

Institute of Biology, Leiden University

Data on birds, fishes, land snails, spiders, caddis flies, dragonflies, parasitic wasps, butterflies and moths is used for biogeographic analyses.

Inventarisation and determination of the Jongmans collection of plant macrofossils from all ages and from all over the world, but with emphasis on the Carboniferous flora from the Netherlands.

Revision of the Early Permian flora from Djambi (Indonesia).

Taxonomic limitation of the genera *Sphenopteris*, *Palmatopteris* and *Diplotmema* in the Westphalian layers of the Dutch Carboniferous.

Late Cretaceous conifers from the Maastrichtian of the type-area were exemplified in Naturalis collections.

University of Utrecht, Utrecht

The fossil researches by the Palaeobotany is concentrated on the following aspects in the

Macropalaeobotany and *in situ* pollen and spores from the Middle Jurassic of Yorkshire, England.

Macropalaeobotany, ecology and *in situ* pollen and spores from the Late Jurassic flora of Sutherland, Scotland.

Triassic/Jurassic floras from Iran and Afghanistan.

Late Triassic flora from Bavaria, Germany Rhaeto-Liassic flora from Bavaria, Germany.

LM, SEM and TEM work on fossil *in situ* spores and pollen (ferns and gymnosperms); comparison with living material.

LM, SEM and TEM work on fossil cuticles.

In addition the following museums were visited—

Rijksmuseum van Oudheden, Leiden;
Hortus botanicus, Leiden;
National Museum of Ethnology, Leiden;
National Museum, Utrecht;
Central Museum, Utrecht;
Palaeobotanisch Museum, Budapestlaan, Utrecht;
Universiteits Museum, Utrecht;
Museum of Natural Sciences, Brussels;
City Museum, Brussels;
NEMO Science Centre, Amsterdam;
Rijks Museum, Amsterdam.

A. Rajanikanth & Rajni Tewari

13th National Conference on Aerobiology

13th National Conference on Aerobiology was held in the Department of Botany, Institute of Science, Nagpur from 31st January to 2nd February, 2005. It was also an occasion of Silver Jubilee Celebration of the Indian Aerobiological Society. The Conference "Mission on Modern Technological Aspects of Aerobiodiversity in the Ecosystem" was aimed to stimulate and disseminate new ideas related with recent trends of aerobiology with advanced technology through scientific deliberations. The Conference was funded by agencies like UGC, CSIR and ICMR. Institute of Science is the premier and prestigious institution of higher learning imparting quality education since 1929 in central India.

The Aerobiological Society held a fruitful existence of the glorious past 25 eventful years with 12 biennial National Conferences held in various cities of India namely Aurangabad, Lucknow, Kalyan, Bodhgaya, Srinagar, Pondicherry, Gwalior, Pune, Hyderabad, Visakhapatnam, Thiru-vananthapuram and Vishwabharti. Besides National Conferences, 5th International Conference was held at Bangalore University in the year 1994 under the stewardship of Prof S. N. Agashe. The aerobiological conference had

always provided a common platform since, 1981 when the first National Conference was organized by Prof S. T. Tilak at Aurangabad.

During the conference CME (Continuing Medical Education) programme on allergy was also arranged on 31st January, 2005 in which three renowned specialists Dr Ashok Arbat, Pulmonologist; Dr Vikrant Saoji, Skin Specialist and Dr A. B. Singh, Aerobiologist delivered lectures on "Nasobronchial allergy", "Skin Allergy", "Environmental aero-allergens" respectively. Besides, an exhibition of different air samplers, allergy related equipments, medicines, etc. were also organized under the banner "Human Health and Environment". Dr (Mrs) A. A. Saoji, the Organizing Secretary, published a souvenir on the occasion of Silver Jubilee Celebration of the Indian Aerobiological Society.

The opening ceremony of the conference was organized in a grand auditorium 'Vasantrao Deshpande Hall', Civil Lines on 31st January 2005 at 4.30 pm. The conference was inaugurated by Hon'ble Dr C. D. Mayee, Chairman ASRB, New Delhi and Chief Guest was Dr (Mrs) Rajni Rai, Ex-Governor, Pondicherry. The Convenor and Organizing Secretary apprised the audience with the forthcoming events of 13th National Conference of Aerobiological Society.

In the Technical Session more than 200 scientists from all over India, research and post-graduate students of different colleges, participated and discussed about the present state of art and the future strategy for the development of Aerobiology. Different aspects of aerobiology were discussed in Seven Technical Sessions beginning with Plenary Lecture by Dr S. T. Tilak. It was first Prof T. Sreeramulu oration lecture entitled "Memoirs of an Aerobiologist". The oral and poster presentations highlighted several new research techniques, improved methodologies and various applications of aerobiological researches in different aspects of environmental studies.

Scientific sessions were divided into seven technical sessions viz., Aerobiodiversity and Human life; Allergy and Immunology; Palynology and Pollen biotechnology; Aeromycology and Plant pathology; Aeromycoflora and Environment; Biodeterioration and Biocontrol measures; Palaeoenvironment and Environmental Biology. Some of the topics which were highlighted include 'Study on airborne fungi in the residences of asthmatics' by S. Bhuvaneshwari and B. P. R. Vittal; "Nutritional adaptability - a boon for sustainable biodiversity of mites' by S. B. Jogand; 'Impact of Aeromycoflora on Human Airways' by P. V. Saroja and Bhagya Lakshmi; Some aspects of pollen physiology in Mamordica charantia - an anti-diabetic plant by A. A. Saoji and K. P. Banerjee. "Pollen in air and surface sediments of Lucknow, India: a critical assessment" by Asha Khandelwal which covered following two important aspects:-

1. Whether all the pollen grains present in the atmosphere are preserved in the sediment?
2. Do the pollen assemblages recovered in surface samples faithfully represent on vegetation growing around which is prerequisite and is required to translate fossil pollen spectra in terms of modern vegetation and thus, forms the basis of Quaternary palynology.

On the whole, the scientific deliberations of the conference were meticulously planned and conducted. In addition to the regular presentation, P. H. Gregory Award contest for the research students was also organized and three prizes were awarded for the best research work done and its presentation in the conference. The conference was concluded giving emphasis on the need to expand aerobiological data from new and still unexplored geographical regions. It was decided in General body meeting of Indian Aerobiological Society that the next conference would be held in Raipur in the year 2006. The Conference ended with valedictory session in the afternoon of 2nd February, 2005.

Aerobiology has a very bright future and prospects with its multidisciplinary approach. Several Indian Universities have started Aerobiology course both at under graduate and post graduate levels. It was felt and recommended that there is an urgent need of "Global Monitoring" of airspora both at local and regional levels. The importance of "Clean air" particularly for allergy patients has been realized. Prof S. N. Agashe stressed that Pollen calendars have great significance in pollen allergy as they provide important guidelines to allergy practitioners with respect to the onset of allergenically significant pollen season, their peak and decline in the air. In this context pollen calendar serves as a bridge between aerobiologists and allergists, as both are dependent on each other and are mutually benefited.

Asha Khandelwal

Deputation to China

On invitation of Institute of Botany, Chinese Academy of Sciences, Beijing, I had visited China during March,12 to April, 29, 2005, to discuss a new project entitled Comparative Study of Tropical Rain Forests between India and China. After discussion with authorities of Chinese Academy of Sciences an agreement for six years (2006 to 2011) on joint project entitled "Cenozoic Vegetation and Climate Change in China and India and their response to the Himalayan Uplift" has been signed and forwarded to authorities of Birbal Sahni Institute of Palaeobotany, Lucknow for consi-deration and collaboration. During the period of my stay at China I visited Yunnan Province, Xishuangbanna Tropical Botanical Garden, Xishuangbanna and Cunming Institute of Botany, Cunming and Xishuangbanna Reserve Forest and studied the tropical rain forest in China.

India and China are the two largest and neighbouring countries of South-east Asia having treasure of living materials i.e., tropical forest. The tropical vegetation in India spreads over Kerala, Tamil Nadu, Karnataka, Andhra Pradesh and Andaman and Nicobar Island in southern part and Arunachal Pradesh, Assam, Manipur and Nagaland in north-eastern region. In China, similar type of vegetation also found in southern part of the provinces of Yunnan, Hainan, Taiwan and Guangdon, and the autonomous regions of Gungxi Zhuang and Tibet. Most of the tropical zone in both the countries are near the sea. The influence of monsoon from Indian Ocean, Pacific Ocean and Arabian Ocean is responsible for heavy rainfall and wet climate in the tropical zone of these regions. The mean annual temperature (20º C and 22º C) and annual precipitation (from 1,500 to 5,000 mm) of these countries are more or less same. The complex land forms and soil type are also similar. Plants grow very well in diverse types of soil in these region. Thus, both the countries endowed by nature with enormous biological diversity which include large number of flora and fauna. As a result, both the countries are among the 12 megadiversity countries of the world. The Yunnan, Hainan Island and south Guangxi Zhuang areas boast a great varieties of plants. These forests come under the world's best tropical rain forests. The best tropical rain forest with richest biological resources and large area in China, is located in Xishuangbanna, Yunnan Province. Similarly the Western Ghats is one of the major tropical evergreen forested region in India which exhibits enormous plant diversity. As many as 400 species of flowering plants from India and 5000 species from China are recorded of which about 50% species are endemic to these regions.

Xishuangbanna has an area of 800 that lies in southern part of the Hengduan Mountain, rising from south to north. The Ailas and Wuliang Mountain in the north prevent cold waves coming to the south and many river valleys in south Xishuangbanna lead southwesterly monsoon into the area, causing high temperature, still wind and high humidity. Effective disposition of water and heat makes Xishuangbanna a cradle of biological evolution and provides excellent condition for the growth of tropical plants. Similar condition also occurs in tropical rain forest of Western Ghats in India.

Compared with the families of tropical rain forest in China, Elaeocarpaceae, Ulmaceae, Euphorbiaceae, Annonaceae, Moraceae, Orchidaceae, Meliaceae, Vitaceae, Apocynaceae, Rubiaceae, Lauraceae, Rutaceae have relatively high species richness in the Xishuangbanna rain forest; while families Dipterocarpaceae, Myrtaceae, Sapotaceae, Clusiaceae, Combretaceae, Arecaceae, Myristicaceae, Melastomaceae. Euphorbiaceae, Rubiaceae, Moraceae, Rutaceae, Malvaceae, Lauraceae, Sterculiaceae and Anacardiaceae have usually higher species richness in the tropical rain forest of Western Ghats in India. The tropical rain forest of Xishuangbanna is huge garden with many species of above and many more families.

The unique and rich natural resources of tropical rain forest produce some biological and ecological feature that are entirely different from forests in other climatic zone. All the plants life grow healthy and coexist in harmony. Trees are large about 70 m high, some species have well developed root buttresses. Various vine plants, mosses, lichens, parasitic and epiphytic plants form a colourful air born garden. Many of the herbaceous plants in this region belong to families of Orchidaceae, Zingiberaceae, Fabaceae, Araceae, Balsaminaceae and Bigoniaceae. Most of the orchids growing in this

area as epiphyte on tree trunks or branches. The area harbours about 351 species and 98 genera of orchids.

The ground in this dense tropical rain forest is wet and dark, suitable for growth of moss, pteridophyte, large leaved plant such as elephants ear (*Colocasia gigantean*). The common aspidistra (*Aspidistra loudianensis*), a kind of lily, has very large flower, with fleshy petals. The endangered plants like snake mushroom (*Balanophora harlandii*) and the parastic flower (*Sapria himalayana*) grow on the root of trees. It has been also observed that various minority communities, residing in this forest are utilizing a large number of plants of medicinal, vegetable, oil, timber, perfumes, dye, resin, fibre, etc. They are of high value for commercial development. Owing to the recent developmental activities, the tropical forests are being damaged and destroyed. Many tropical flowering plants have disappeared and some are at the verge of extinction. The destruction of natural resources has aroused the attention of Chinese Government. To protect and conserve the natural wealth, the Central Government has set up Man and Biosphere Commission and large number of natural reseves have been established during recent past. Xishuangbanna rain forest is one of them. This time Xishuangbanna tropical rain forest is in the UNESCO's list of World Biosphere Protection Network for their rich species resources and unique ecological environment.

D. C. Saini

SERC School on Concepts in Quaternary Geology

A training program on Quaternary Geology was organized by IIT-Kanpur during March 27 - April 16, 2005. This was the first module of a five year program on "Crustal deformation and tectonic geomorphology" funded by the Department of Science and Technology, New Delhi. The first school started with a basic module on the "Concepts in Quaternary Geology". The subsequent modules will deal with "Techniques for studying Crustal Deformation", "Kinematics and Geometry of Deformation", "Quaternary Tectonics and Paleosiesmology" and "Tectonics-Climate Connection". These courses will be conducted within the next four years by different institutions in the country.

The course structure for the first module was divided into four major sections viz., Quaternary geomorphology and landscape development, Quaternary stratigraphy, Quaternary climate, and special topics in Quaternary geology. Additionally most of the speakers conducted practical sessions and a field trip was arranged in the nearby areas. About 20 participants from various universities and institutions in India participated in this School. The authors represented BSIP as resource persons.

There were thirteen resource persons who delivered lectures on different topics. On the inaugural day Prof V. K. Gaur described how the Earth's thermodynamic engine is driven by plate tectonics. He also explained the role of thermohaline circulation of the oceans in controlling the global climate, what are the forcing factors that drive the Milankovitch periodicities that in turn bring ice ages on Earth. Prof S. K. Tandon explained the basic principle of Quaternary Stratigraphy and how it is useful in understanding the climate variability through the analysis of fossil records. In a series of lectures Dr R. Sinha of IIT-Kanpur taught Quaternary Geomorphology, Landscape Development and Quaternary Climates and Quaternary Stratigraphy and Climate Reconstruction of the Ganga Basin: a regional synthesis. Dr S. J. Sangode of the Wadia Institute of Himalayan Geology undertook courses on Magneto-stratigraphy and its application in the Quaternary Deposits and then Theory of Rock Magnetism and their Applications to Quaternary Records. Dr S. Chakraborty, BSIP gave courses on the Principle of Isotopic Fractionation and Radiocarbon Geochronology. Dr O. S. Chauhan, NIO, delivered lectures on Sea Level Changes and its Consequences. Dr N. R. Phadtare, WIHG took classes on Palynological Methods of Climate Reconstruction. Dr A. Bhattacharyya, BSIP explained the principles of Dendrochronology and Dendro-climatology. Prof L. S. Chamyal, M. S. University of Baroda discussed different aspects of Quaternary Geology and Geomorphology of Gujarat. Prof S. Krishnaswami of PRL described the use of Cosmogenic Isotopes in determining the sediment flux and uplift rates. Prof V. Rajamani of the Jawaharlal Nehru University, New Delhi gave lucid presentations on the Floodplain Geochemistry: implications for climatic

Participants of SERC School at BSIP Museum

reconstructions and Shallow sub-surface studies. Prof B. C. Raymahashay, IIT-Kanpur delivered lectures on Arsenic in alluvial sediments. Dr J. N. Mallik, IIT-Kanpur taught various aspects of Earthquake geology and paleosiesmology.

A panel discussion was arranged on Earth Science Education in India. The topic of the discussion was to initiate a two-year master course on Earth System Science-at IIT Kanpur. The panelists agreed upon the fact that courses offered in geology/earth science in India lack the excitement and advances made in this field in the last few decades. There is an urgent need to design a course that will integrate atmosphere, biosphere, hydrosphere, lithosphere and the solid earth. Like other branches of physical science the traditional geology course should be taught as Earth System science- the panelists observed.

On 12th April the participants came to BSIP as part of the School program. They visited various laboratories, museum, etc. They were given practical demonstration on pollen counting, ring chronology, sample processing for C^{14} dating, etc. The participants were also introduced to the Director, BSIP Dr N. C. Mehrotra.

S. Chakraborty & A. Bhattacharyya

Summer Training on Electron Microscopy

All India Institute of Medical Sciences, Department of Anatomy, New Delhi organized a Summer Training Programme of Electron Microscopy from 16th May, 2005 to 30th June, 2005. Prof Shashi Wadhwa, Officer-in-Charge was the Convener and Dr T. K. Das was the Organizing Secretary of the course. The course was aimed to develop the manpower in the field of Electron Microscopy, particularly sample preparation and micro-photography techniques.

Participants from Bhabha Atomic Research Centre (BARC), Mumbai, G. B. Pant Agricultural University, Pantnagar and Birbal Sahni Institute of Palaeobotany, Lucknow attended the programme.

The course was divided into two parts: (1) TEM : sample preparation techniques, viewing micro-photography for Transmission Electron Microscopy, (2) SEM: sample preparation techniques, viewing microphotography for Scanning Electron Microscopy.

TEM—Dr T. C. Nag, Assistant Professor and Course Faculty Member delivered a lecture on "Sample preparation techniques for Transmission Electron Microscopy". The talk covered the protocol used for grid preparation for the TEM viewing in the laboratory and also details techniques used in fixation, washing and dehydration and embedding of the samples. The processes of sample preparation were observed in the

A Trainee Participant on SEM at AIIMS

laboratory. Fixation is the first step in preparation of biological specimens for electron microscopy. By this process, using certain chemical compounds which prevent autolysis, change in volume and shape and help in preserving various chemical constituents of the cell, the structure of the sample retains its original structure almost instantaneously. Commonly used fixatives are glutaraldehyde, paraformaldehyde and osmium tetraoxide. After fixation, specimen should be rinsed thoroughly to wash off the excess fixatives with buffer (phosphate or cacodylate buffer). The water is removed by passing the tissues through a series of solutions of ascending concentration of dehydrating agents-ethanol or acetone. Subsequent to washing and dehydration, the tissues are embedded in the embedding medium (resine mixture: araldite, dodecenyl succinic anhydride, tridimethylaminomethyl phenyl, dibutyl phthalate) using gelatine or beam capsule (mould) in required orientation. After polymerization process is completed, the block is removed from the mould for microtomy. Using glass knife which was usually prepared from knife maker of Belgium glass stripes, ultra-thin sections of the order of 60-90 nm were prepared. These ultra-thin sections are collected on the copper or nickel grid. These grids are stained by uranyl acetate and lead citrate. For small particulate specimens negative staining was done using phosphotungustic acid (PTA).

These stained grids were viewed on TEM Morgangni Fei 268D Transmission Electron Microscope for the microphotography. The detailed images were stored on the CDs or exposed on the photographic film.

SEM—Dr T. K. Das, Associate Professor of Department of Anatomy and Organizing Secretary of the course gave a talk on "Sample preparation techniques used in the Scanning Electron Microscopy". Various aspects of sample preparation protocol used in the laboratory for SEM studies were detailed out. Sample cleaning, dehydration and drying methods and coating process of sample for SEM were highlighted. The process of SEM sample preparation is same as TEM. However, for TEM viewing, we need ultra-thin sections but in SEM we have to see the morphological characteristics of the surface. In order to view morphological characteristics, the surface of the sample is cleaned by certain chemicals and/or ultrasonicator. After cleaning of the surface the sample is fixed, dehydrated and dried. Different methods are used for the sample such as air drying, critical point drying method and chemical drying method.

Critical Point Drying (CPD) method is most commonly used for plant and soft tissues to avoid alteration of natural surface features. This method was demonstrated and explained to the participants. During this procedure the sample was transferred from an organic dehydration medium (acetone) to drying medium (liquid CO_2) in a chamber, which was cooled and put under pressure. When the dehydration agent (acetone) was completely removed and impregnated with the liquid CO_2, the chamber was warmed up to that point (31.5° C and 1100 psi Critical Point) where the densities of the drying medium were same in both the liquid and gas phase. Phase boundary disappears and CO_2 released gradually to avoid condensation. The sample became dry. After completion of drying process the specimen was mounted on the aluminium stubs with conductive paint or adhesive

tape and coated immediately.

Biological specimens are usually poor electrical conductives. The conductivity can be increased if the specimen is coated with a thin layer (30-40 nm) of metal conductor. Silver, Gold, Palladium, etc. are commonly used metals for coating. Coating can be done either by thermal evaporation or sputter coating system. After coating the sample, it is viewed under Scanning Electron Microscope LEO 435 VP. It has variable pressure option and can operate in both high and low vacuum mode.

Some samples were viewed on low vacuum mode using the Back Scattered Electron Detector without coating and dehydration process. Images taken on low vacuum mode are useful if one wants quick results of the sample. The images come in this mode have poor resolution than images taken on high vacuum mode using Secondary Electron Detector.

During training, the sample preparation techniques and microphotography techniques using TEM Morgangni 268D Fei, SEM Leo435 VP, Leica Microtome, Leica Knife cutter, Bio-Rad CPD, etc. were imparted to all the trainees.

Subodh Kumar

Training Programme on Bioinformatics: Tools & Applications

The Biotech Park organized a training program in Bioinformatics : Tools and Applications from 18-20th May, 2005. The program was sponsored by Department of Biotechnology, Government of India, with the aim to impart relevant knowledge about Bioinformatics, its concepts, tools, applications and usage in present day context. The training programme consisted of lectures and practical demonstrations from experts. The aim of the course was to make the participants get an in-depth knowledge of Bioinformatics. A computer CD consisting of various Bioinformatics software was also provided to the participants.

The following recommendations were made- Bioinformatics or Computational Biology is the use of techniques from Applied Mathematics, Informatics, Statistics and Computer Science to solve biological problems. Bioinformatics is a holistic science incorporating pertinent aspects & concepts from Botany, Zoology, Computer Science, Mathematics, Statistics, Chemistry and Engineering. In layman's term, Bioinformatics is the marriage of Biology and Computer Science.

It was recommended to:

- Make Lucknow a BioTech city as was resolved earlier in 89th Session of Indian Science Congress.
- Disseminate Bioinformatics information by holding more such courses.
- Use the Bioinformatics softwares in their respective organizations.
- Set up a Bioinformatics unit in their organizations.
- Seek suitable help from Department of Biotechnology which is set up for this sole purpose.

Madhavendra Singh & Syed Rashid Ali

Participants of Training on Bioinformatics at RSAC, Lucknow

Lectures

By Institute's Staff

A. K. Srivastava

- *Late Palaeozoic plant fossil assemblages from India* at National Conference on Recent Trends in Botany, Chandrapur (December 19, 2004).

G. P. Srivastava

- *Angiosperm taxonomy* (series of 12 lectures) to M.Sc. students at Department of Botany, Lucknow University, Lucknow (April-May 2004).

C. M. Nautiyal

- *Hindi mein janruchi vigyan lekhan* during Hindi Workshop at BSIP (May 20, 2004).
- *Mangal Grah par Manav ki Dastak* (Radio talk) on National Channel in Vigyan Bharati (May 26, 2004).
- *Venus Transit* at Bal Vidya Mandir, Lucknow (June 8, 2004).
- *Science Projects in Review* Workshop on NCSC by VICAS/RVPSP (DST) at Allahabad (August 12-13, 2004).
- *Hindi mein vyavhar* at Kribhco, Lucknow (September 28, 2004).
- *Measurement and Quantitative Evaluation of Scientific Attitude* at National Seminar on Scientific Attitude: Role of Media, Rajasthan University, Jaipur (November 29-30, 2004).
- *Science Communication* (2 lectures) at PA University, Ludhiana (January 13-14, 2005).
- *Physics in Palaeobotany* at LBS PG College, Gonda (February 4, 2005).
- *Planets, Plants and Physics*, BSIP, Lucknow 25th February, 2005.

Asha Khandelwal

- *Pollen allergy* at St. John's College, Agra (September 13, 2004).

Neerja Jha

- *Pollen and Spores tell the Age of the Rocks* at Bal Vidya Mandir Senior Secondary School (Charbagh), Lucknow.

Rakesh Saxena

- *Coal and Oil Energy* (Key Speaker) at Kishan Uchchatar Madhyamic Vidhyala, Gonda (January 23, 2005).
- *Coal and Lignites* (four lectures) at Geology Department, Panjab University, Chandigarh (March, 2005).

A. Rajanikanth

- *Past Plant Extinctions* at Department of Botany, Jammu University, Jammu (February 9, 2005).
- *Palaeobotany and Allied Sciences* at Lucknow Christian College, Lucknow (February 25, 2005).
- *Empowerment through Information and Biotechnologies* at AIMS Academy, Gonda (March 30, 2005).
- *Upper Gondwana Palynology* at Geological Survey of India Training Institute, Hyderabad (June 27, 2005).

Mukund Sharma

- *Inter-relationship (Position and Connection) between South China Block vis a vis Australia and India in SWEAT Hypothesis: Neoproterozoic Biogeography and Organismal Constraints* at IGCP-440 National Workshop, Thiruvananthapuram (November 19, 2004).

A. Bhattacharyya

- *Prospects of Tree-ring and Pollen Data in Analyzing Fluvial Environment* in a DST sponsored Training Programme on Fluvial System at Department of Geology, M.S. University, Baroda (November, 2004).
- *Dendrochronology and Dendroclimatology and Tree-ring Study in India* in a DST sponsored SERC School on Crustal Deformation and Tectonic Geomorphology Module1: Concepts in Quaternary Geology at IIT, Kanpur (March-April, 2005).

Jyotsana Rai

- *Kyon aate hain Bhukamp* at All India Radio, Lucknow.

Rashmi Srivastava

- *Origin and Evolution of Indian Forest: A Palaeobotanical Analysis* at Institute of Advanced Studies in Education, Department of

Education, Lucknow in an orientation programme for science school teachers (March 8, 2005).

Supriya Chakraborty

- Harmonic Oscillations and their Applications to Palaeoclimate on February 15, 2005.
- *Stable Isotopes Systematic and Radiocarbon Geochronology* (short courses) at the SERC School on "*Concepts in Quaternary Geology*" sponsored by DST and held at IIT, Kanpur (March 30-31, 2005).

A. K. Ghosh

- *Feed back of the 2nd Foundation Training Programme for Scientists and Technologists* in the DST sponsored Review/Brain Storming Session- DST Training held at New Gurgaon (October 23, 2004).

B. Sekar

- *Isotopic dating techniques and Archaeological Chemistry* (a series of six lectures) at Institute of Archaeology, New Delhi (July 15-16, 2004).

Y.P. Singh

- *Computer applications for UGC Sponsored Remedial Coaching Program* at Babasaheb Bhimrao Ambedkar University, Lucknow (November 11, 2004).

S. C. Bajpai

- *Solar Energy : The Infinite source of energy* at University College of Science. Mohanlal Sukhadia University, Udaipur on January 19, 2005.
- *Birbal Sahni Institute of Palaeobotany, Lucknow: a Pioneer and the only Research Institute devoted to Palaeobotany in the World* at University College of Science. Mohan Lal Sukhadia University, Udaipur (Rajasthan) on January 19, 2005.
- *Energy Efficient Buildings for Composite Climates* at the Navyug Kanya Post Graduate College, Lucknow on February 21, 2005.
- *Global and National Energy Scenario* at the Non-Conventional Energy Research Development and Training Centre Chinhat, Lucknow (June 07, 2005 & June 14, 2005).
- *Integrated Rural Energy Programme A case study?* at the Non-Conventional Energy Research Development and Training Centre Chinhat, Lucknow (June 10, 2005 & June 17, 2005).

By Guest Speaker

Prof J. C. Kapur

Prof J. C. Kapur
Programme Director, Indian Institute of Public Administration, New Delhi

- *e-Governance: Possibilities and Constraints* (August 20, 2004).

Dr William Wright
Lamont Doherty Earth Observatory, New York, USA

- *Reconstruction of Asian Monsoon Variability from Tree-rings: A new beginning* (November 03, 2004).

Dr Tomasz Zielonka
Institute of Botany, Krakow, Poland

- *Application of tree-ring studies in understanding the Forest Dynamics in Europe* (November 19, 2004).

Prof Cheng-Sen Li & Prof Yu-Fei Wang
Institute of Botany, Chinese Academy of Sciences, Beijing, China

- *Climate, Vegetation and Landscape in China: Present and Past Conditions* (December 14, 2004).

Staff News

Appointments

Dr Naresh Chandra Mehrotra, Director w.e.f. 01.03.2005.
Dr K. S. Saraswat, Emeritus Scientist w.e.f. 01.04.2005.
Sri S. K. Basumatary, Scientist 'B' w.e.f. 15.06.2005.
Sri V. K. Singh, Scientist 'B' w.e.f. 15.06.2005.
Sri Ajay Kumar Arya, Scientist 'B' w.e.f. 24.06.2005.
Sri Sumit Bisht, Technical Assistant 'D' w.e.f. 12.07.2005.
Miss Sudha Kureel, L.D.C. w.e.f. 12.05.2005.
Sri Ravi Shankar, Attendant-I w.e.f. 12.05.2005.

Project Staff

Sri Krishna Gopal Mishra, J.R.F. w.e.f. 01.11.2004.
Miss Divya Srivastava, J.R.F. w.e.f. 12.01.2005.
Miss Vartika Singh, J.R.F. w.e.f. 14.02.2005.
Miss Jyoti Sharma, J.R.F. w.e.f. 23.02.2005.
Sri Jagdish Prasad, Field Assistant w.e.f. 29.10.2004.

Promotions

Dr Ashwini K. Srivastava, Scientist 'F' w.e.f. 01.04.02.
Dr Rahul Garg, Scientist 'F' w.e.f. 01.04.04.
Dr Ramesh K. Saxena, Scientist 'F' w.e.f. 01.04.04.
Dr Manoj Shukla, Scientist 'F' w.e.f. 01.04.04.
Dr (Mrs) Archana Tripathi, Scientist 'F' w.e.f. 01.04.04.
Dr (Mrs) Usha Bajpai, Scientist 'E' w.e.f. 01.04.02.
Dr (Mrs) Neerja Jha, Scientist 'E' w.e.f. 01.04.02.
Dr (Mrs) Asha Khandelwal, Scientist 'E' w.e.f. 01.04.02.
Dr Basant K. Misra, Scientist 'E' w.e.f. 01.04.02.
Dr Mulagalapalli R. Rao, Scientist 'E' w.e.f. 01.04.02.
Dr Samir Sarkar, Scientist 'E' w.e.f. 01.04.02.
Dr Ram R. Yadav, Scientist 'E' w.e.f. 01.04.02.
Dr Rama S. Singh, Scientist 'E' w.e.f. 01.04.03.
Dr S. K. M. Tripathi, Scientist 'E' w.e.f. 01.04.03.
Dr Anil Agarwal, Scientist 'E' w.e.f. 01.04.04.
Dr Khowaja Ateequzzaman, Scientist 'D' w.e.f. 01.04.02.
Dr Rupendra Babu, Scientist 'D' w.e.f. 01.04.02.
Dr Mohan S. Chauhan, Scientist 'D' w.e.f. 01.04.02.
Dr (Ms) Asha Gupta, Scientist 'D' w.e.f. 01.04.02.
Dr (Mrs) Jyotsana Rai, Scientist 'D' w.e.f. 01.04.02.
Dr (Mrs) Alpana Singh, Scientist 'D' w.e.f. 01.04.02.
Dr Bhagwan D. Singh, Scientist 'D' w.e.f. 01.04.02.
Dr (Mrs) Rashmi Srivastava, Scientist 'D' w.e.f. 01.04.02.
Dr (Mrs) Rajni Tewari, Scientist 'D' w.e.f. 01.04.02.
Dr Bhagwan D. Mandaokar, Scientist 'D' w.e.f. 01.04.03.
Dr (Mrs) Neeru Prakash, Scientist 'D' w.e.f. 01.04.03.
Dr Kindu L. Meena, Scientist 'D' w.e.f. 01.04.04.
Dr Gyanendra K. Trivedi, Scientist 'D' w.e.f. 01.04.04.
Dr (Mrs) Anjum Farooqui, Scientist 'C' w.e.f. 01.04.02.
Dr Amit K. Ghosh, Scientist 'C' w.e.f. 01.04.02.

Dr (Mrs) Madhabi Chakraborty, T.O. 'C' w.e.f. 01.04.02.
Mrs Asha Guleria, T.O. 'C' w.e.f. 01.04.02.
Sri T. K. Mandal, T.O. 'C' w.e.f. 01.04.02.
Sri V. K. Singh, T.O. 'C' w.e.f. 01.04.03.
Sri P. S. Katiyar, T.O. 'C' w.e.f. 01.04.04.
Dr E. G. Khare, T.O. 'C' w.e.f. 01.04.04.
Mrs Sunita Khanna, T.O. 'B' w.e.f. 01.04.02.
Mrs Reeta Banerjee, T.O. 'B' w.e.f. 01.04.04.
Mrs Kavita Kumar, T.O. 'B' w.e.f. 01.04.04.
Sri Chandra Pal, T.O. 'B' w.e.f. 01.04.04.
Sri V. P. Singh, T.O. 'B' w.e.f. 01.04.04.
Sri Avinesh K. Srivastava, T.O. 'B' w.e.f. 01.04.04.
Sri R. L. Mehra, T.O. 'A' w.e.f. 01.04.02.
Sri V. K. Nigam, T.O. 'A' w.e.f. 01.04.03.
Sri Keshav Ram, T.O. 'A' w.e.f. 01.04.03.
Sri S. R. Yadav, T.A. 'E' w.e.f. 01.04.03.
Sri Chandra Bali, T.A. 'E' w.e.f. 01.04.04.

Mrs Munni, Attendant III w.e.f. 11.07.05.
Sri Shri Ram, Attendant III w.e.f. 11.07.05.
Sri K. K. Bajpai, Attendant II w.e.f. 11.07.05.
Sri Ram Dheeraj, Attendant II w.e.f. 11.07.05.
Sri Hari Kishan, Attendant II w.e.f. 11.07.05.
Sri Dhan B. Kunwar, Attendant II w.e.f. 11.07.05.
Sri Ram Ujagar, Attendant II w.e.f. 11.07.05.

Institute's Staff participating in a Meditation Camp

Retirements

Dr G. P. Srivastava, Scientist 'E', retired on 30.09.2004

Dr Anil Chandra, Scientist 'F', retired on 31.12.2004

Sri R. B. Kukreti, Maintenance Officer, retired on 31.03.2005

Sri I. J. Mehra, Section Officer, retired on 31.05.2005

Dr B. K. Misra, Scientist 'E', retired on 30.06.2005

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हिन्दी परिशिष्ट

निबन्ध लेखन प्रतियोगिता 2004 *प्रथम पुरस्कार*

"राष्ट्र की प्रगति में प्रौद्योगिकी का स्थान"

प्रस्तावना

यद्यपि 'शीत युद्ध' समाप्त हो गया है, फिर भी विकसित देशों द्वारा चुनी गई दांव-पेंच की नीतियाँ आज भी अपना काम कर रही हैं। इनके माध्यम से वे अविकसित तथा विकासशील देशों पर सैनिक तथा आर्थिक दृष्टि से हावी होते जा रहे हैं। कई प्रकार की उन्नत व लाभकारी प्रौद्योगिकियों को उनकी पहुँच से दूर रखा जाता है तथा घटिया किस्म की प्रौद्योगिकी उन पर थोपी जा रही है। यदि किसी राष्ट्र को इन सब कुचक्रों से बचना है तो उसे अपनी 'निजी' प्रौद्योगिकियों को निरंतर विकसित करते रहना होगा तथा उनमें आत्म-निर्भरता प्राप्त करनी होगी क्योंकि प्रौद्योगिकी ही आर्थिक विकास की कुँजी है।

किसी भी राष्ट्र की उन्नति उसकी उन्नत प्रौद्योगिकी तथा उसमें कार्यरत लोगों की कर्मठता पर निर्भर करती है। प्रौद्योगिकी की सफलता उसकी परियोजना पर भी निर्भर करती है। कोई भी राष्ट्र स्पष्ट परिकल्पना के बिना उन्मत्त सागर की लहरों पर यात्रा करते हुए उस जहाज के समान है जिसके पास न कोई दिशा है, न ही कोई लक्ष्य! परिकल्पना की स्पष्टता ही लोगों को सदैव उनके लक्ष्य तक पहुंचने तथा उसे प्राप्त करने के लिए प्रेरित करती रहती है।

प्रौद्योगिकी का विकास

प्रारम्भ से 1500 ई.पू. के दौरान मुख्य प्रौद्योगिकियाँ इस प्रकार से हैं - शिकार हेतु हथियारों का निर्माण व उनका प्रयोग, नाव, पाल नाव, अग्नि की खोज व उसका उपयोग। जैसे-जैसे समय बीतता गया, मानव-मस्तिष्क का भी विकास हुआ और उसने नई-नई प्रौद्योगिकियों को जन्म दिया।

1500 ई.पू. से सन् 700 ई : इस दौरान मुख्य प्रौद्योगिकियों में घड़ी, कुतुबनुमा, मापन यन्त्र, भोजन पकाना, घरों का निर्माण, युद्ध के लिए तलवार, बरछी, भाले, आदि का निर्माण व उनका प्रयोग है।

700-1900 ई. : यन्त्र चालित कैलकुलेटर, रेलवे मार्ग, कोयले व तेल का प्रयोग, बिजली व उसके उपकरण, दूर-संचार, एक्स-रे, पानी के जहाज, चलचित्र, ध्वनि, प्रतिबिम्ब, आदि इस समय की मुख्य प्रौद्योगिकियाँ हैं।

1900-1950 ई. : कार, सड़क, वायुयान, रासायनिक उत्पाद, वस्त्रों का विशाल उद्योग, कम्प्यूटर, आदि इस अवधि की मुख्य प्रौद्योगिकियाँ हैं।

1950-1960 ई. : घरेलू उपयोग के उपकरणों का व्यापक पैमाने पर निर्माण व प्रयोग इस दौर की मुख्य प्रौद्योगिकियाँ हैं।

1960-2000 ई. : इस अवधि में उर्वरक, गर्भ निरोधक, लेज़र, मानव की चन्द्रमा पर विजय, कृत्रिम उपग्रह, मानव अंगों तथा ऊतकों (tissues) का प्रत्यारोपण, कैट स्कैन, आनुवांशिकीय इंजीनियरी, इन्टरनेट, आदि मुख्य प्रौद्योगिकियाँ हैं।

प्रौद्योगिकी का महत्व

राष्ट्रीय विकास-क्रम में प्रौद्योगिकी का वही स्थान है जो नाभिक का कोशिका में! उन्नत प्रौद्योगिकी के बिना कोई भी राष्ट्र अपनी जनता का सर्वांगीण विकास नहीं कर सकता। आज हर देश नई-नई प्रौद्योगिकीय परियोजनाएं बनाता है और उन्हें सफल बनाने के लिए निरंतर प्रयास करता रहता है। सैनिक तथा आर्थिक क्षेत्रों का सीधा सम्बन्ध प्रौद्योगिकी से है।

अन्तर्राष्ट्रीय बाज़ारों की प्रतिस्पर्धात्मक भूमिका में प्रौद्योगिकीय शक्तियाँ उत्पादन तथा अन्य क्षेत्रों में रोज़गारों को बढ़ावा देती हैं। कुछ निजी संस्थाओं को भी आजकल प्रौद्योगिकीय परियोजना के कार्यों से जोड़ा जा रहा है। इस प्रकार यह एक नया व्यवसाय बनता जा रहा है। इन संस्थाओं की रिपोर्टों के कुछ बिन्दु इस प्रकार हैं: उन्नत पदार्थ, जैव-प्रौद्योगिकी, इलेक्ट्रॉनिक्स, पर्यावरण, भवन-निर्माण, औजारों के निर्माण की आधुनिक प्रौद्योगिकियाँ (डिज़ाइन, रोबोटिक्स, कैड, कैम, आदि का प्रयोग), खाद्य प्रसंस्करण, आदि।

विभिन्न राष्ट्रों की उन्नति

भारत की भाँति, अन्य देश भी अपनी भावी 'प्रौद्योगिकीय परिकल्पना' तैयार करते हैं और उन्हें सफल बनाने में वहां के नागरिकों की भी भूमिका अहम होती है; यहां तक कि मीडिया वाले भी इस सद्कार्य में खूब सहयोग करते हैं। आज हर देश-'विकसित-राष्ट्र' की श्रेणी में आना चाहता है। वह अपनी उन्नत प्रौद्योगिकियों के सहारे विदेशी मुद्रा भी अर्जित करना चाहता है इससे उसकी आर्थिक स्थिति और सुदृढ़ होगी।

अमरीका, यूरोप और चीन सुरक्षा सम्बन्धी परियोजनाओं पर अधिक धन व्यय करते हैं। कृषि के क्षेत्र में चीन और भारत की परियोजनाओं में काफी समानता है। यूरोप, जापान और अमरीका जैव-प्रौद्योगिकी पर भी अधिक बल देते हैं तथा उससे सम्बन्धित जानकारियां शेष विश्व को बेचकर विदेशी मुद्रा अर्जित करते हैं। विभिन्न देशों द्वारा उनकी उन्नति के लिए प्रौद्योगिकियों का उपयोग इस प्रकार से है:-

अमरीका और यूरोप—प्राकृतिक संसाधनों, उन्नत प्रौद्योगिकियों तथा कर्मठ लोगों के बल पर ही ये दोनों राष्ट्र प्रमुख औद्योगिक, आर्थिक, व्यापारिक तथा सैन्य क्षेत्र में महाशक्ति बने हैं। वहाँ के नागरिकों की भी इसमें अहम भूमिका है। प्रौद्योगिकियों को उन्नत बनाने हेतु आवश्यक धन का 20% भाग वहां की सरकार तथा 80% भाग उद्योगपतियों द्वारा लगाया जाता है इनमें कुछ प्रमुख नाम हैं- रिचर्ड ब्रॉनसन, जॉर्ज ईस्टमैन तथा बिल गेट्स, आदि।

मलेशिया—अपने बागानों के लिए नई प्रौद्योगिकी विकसित कर मलेशिया ने दुनिया में तहलका मचा दिया। अब वहां के लोग पहले से अधिक सम्पन्न हैं तथा उनके राष्ट्र की आर्थिक स्थिति पहले से कहीं बेहतर है। केवल बागानों पर आधारित उनकी अर्थव्यवस्था की सफलता का श्रेय उनके प्रधानमन्त्री महाधिर मोहम्मद की दूर-दर्शिता तथा स्पष्ट परियोजना को जाता है। यही नहीं, घरेलू उद्योग, पर्यावरण, विज्ञान एवं प्रौद्योगिकी तथा इससे सम्बन्धित अन्य परियोजनाओं पर भी शोध जारी है।

चीन—इनकी परियोजनाओं का मुख्य उद्देश्य है विज्ञान एवं प्रौद्योगिकी से जुड़े विभिन्न क्षेत्रों का बहुमुखी विकास क्योंकि इन्हीं क्षेत्रों में उसे पूर्व में कई बार असफलता का सामना करना पड़ा था। वर्तमान में चीन अन्य विकसित देशों से लगभग 30 वर्ष पिछड़ा हुआ है। जैसा कि पहले भी उल्लेख किया गया कि चीन और भारत की परियोजनाओं में काफी समानता है; अतः उनका सविस्तार वर्णन हमारे हित में ही होगा।

चीन की नई परियोजनाओं में जिन क्षेत्रों को सम्मिलित किया गया है वे इस प्रकार हैं:-

1. भोजन के नये स्रोतों की खोज तथा भोजन की गुणवत्ता में सुधार
2. कृषि तथा उत्पादों को बढ़ाना
3. कृषि तथा भवन निर्माण की प्रौद्योगिकियों का नवीनीकरण
4. गांवों को उन्नत बनाना
5. रेलवे यातायात में वृद्धि तथा गति सीमा को 200 किमी./घ. बढ़ाना
6. इलेक्ट्रॉनिक्स तथा मशीनी पुर्जों के निर्माण में और अधिक आत्मनिर्भरता प्राप्त करना
7. 'मैकाट्रॉनिक्स' के क्षेत्र को और अधिक विकसित करना
8. सामाजिक तथा सार्वजनिक सुविधाओं तथा सेवाओं के तकनीकी-स्तर को ऊंचा उठाना
9. 'एयरो स्पेस' प्रौद्योगिकी का विकास
10. स्वास्थ्य पर्यावरण तथा जैव-प्रौद्योगिकी पर अधिक बल
11. गैस पाइप लाइनों का विस्तार व विकास
12. प्रौद्योगिकी-आधारित निर्यात को बढ़ावा

जापान—जापान ने अपनी दीर्घकालिक परिकल्पना को सफल बना कर एक नया इतिहास रचा है। जहां भारत ने इस दिशा में अभी पहल ही की है वहीं जापान ने 'पाँचवाँ प्रौद्योगिकीय भविष्य वाणी सर्वेक्षण 2020' पेश किया है। उनकी परियोजना से जुड़े कुछ क्षेत्र इस प्रकार हैं- सूचना-प्रौद्योगिकी, इलेक्ट्रॉनिक्स उद्योग, समुद्रीय विज्ञान, भू-विज्ञान, जैव-प्रौद्योगिकी, कृषि, वानिकी, मात्स्यकी, ऊर्जा, परिवहन, स्वास्थ्य, पर्यावरण, आदि।

दक्षिण कोरिया—सन् 1950 के युद्ध के बाद दक्षिण कोरिया ने इतनी अधिक उन्नति की है कि उसकी गिनती विश्व के अग्रणी देशों में होने लगी है। इन परियोजनाओं की सफलता के पीछे वहाँ के कर्मठ लोग हैं। उन्होंने प्रमुख आर्थिक क्षेत्रों में आधुनिक प्रौद्योगिकियों के नये-नये प्रयोग किये तथा उनमें उन्हें सफलता मिली।

इज़राइल—'एग्रो फूड' के क्षेत्र में इज़राइल विश्व में प्रथम स्थान पर है। वहां प्रति मवेशी प्रति वर्ष दुग्ध-उत्पादन 9200 कि.ली. है, जबकि अमरीका का 7000 कि.ली. तथा भारत का सबसे कम 500 कि.ली. मात्र है। यही नहीं, सैनिक, आर्थिक तथा शिल्प-प्रौद्योगिकी में भी वह दुनिया में श्रेष्ठ है। इसके पीछे वहां के नागरिकों का अथक प्रयास है ।

भारत—अभी तक भारत में जो भी उन्नति हुई है वह किसी दीर्घकालीन परिकल्पना के अन्तर्गत नहीं हुई। यही कारण है कि आज हम पश्चिमी देशों से लगभग 50 वर्ष पिछड़े हुए हैं।

प्रौद्योगिकी का भविष्य

सन् 1988 में टाइफैक (TIFAC- The Technology, Information, Forecasting & Assessment Council) का जन्म हुआ। इस परिषद् का मुख्य कार्य दुनिया भर में विकसित हो रही प्रौद्योगिकियों की पूर्व-जानकारी एकत्रित करना, उन पर विस्तार से विचार करना तथा उनमें से भारत के लिए उपयुक्त प्रौद्योगिकीय-पथों का चुनाव करना है। इस संस्था को सफल बनाने में सरकारी तथा गैर सरकारी संस्थाओं के विभिन्न क्षेत्रों से 500 बुद्धिजीवियों ने प्रत्यक्ष रूप से और 5000 बुद्धिजीवियों ने परोक्ष रूप से योगदान दिया। यहां पर हम 'टाइफैक' द्वारा सुझाये गये विभिन्न प्रौद्योगिकियों तथा उनसे सम्बन्धी आयामों का संक्षेप में वर्णन करेंगे।

सर्वप्रथम हमने अपनी मूलभूत आवश्यकताओं एवं मूल प्रौद्योगिकियों को चिह्नित किया है। आज हमारे देश के सम्मुख 'ज्वलंत समस्या' जनसंख्या विस्फोट है जो कि वास्तव में 'नाभिकीय विस्फोट' से कहीं अधिक घातक है। वर्ष 2000 में हमारी जनसंख्या एक अरब थी और प्रति वर्ष इसमें 2 करोड़ की वृद्धि हो रही है। इस हिसाब से हम आज (सन् 2004) एक अरब 8 करोड़ हैं और सन! 2020 तक एक अरब 40 करोड़ हो जायेंगे। कहीं ऐसा न हो कि यह विकराल दैत्य हमारी प्रौद्योगिकी को ही लील जाये! अतः समय रहते हमें इस दिशा में ठोस व कारगर कदम उठाने होंगे।

प्रौद्योगिकीय परिकल्पना 2020 के कुछ मुख्य-क्षेत्र इस प्रकार हैं—अनाज उत्पादन को बढ़ाना, इलेक्ट्रॉनिक्स, जैव–प्रौद्योगिकी, सूचना-प्रौद्योगिकी, सॉफ्टवेयर इंजीनियरी का विस्तार, पर्यावरण, स्वास्थ्य, शिक्षा, गांवों को उन्नत बनाना, अन्तरिक्ष अभियानों में सम्पूर्ण आत्म निर्भरता, गैर-पारम्परिक ऊर्जा के विकास व विस्तार को बढ़ावा, आदि।

उपसंहार

कोई भी राष्ट्र बिना उन्नत प्रौद्योगिकी के टिक नहीं सकता! राष्ट्र की उन्नति उसकी मूल प्रौद्योगिकियों में छिपी है। अतः उन्नति करने के लिए हर क्षेत्र में निरंतर नई-नई प्रौद्योगिकियाँ विकसित करनी होंगी तथा साथ ही साथ उनमें नवीनीकरण भी करते रहना होगा क्योंकि यह कभी न थमने वाली प्रक्रिया है। भारत की लगभग 80% जनसंख्या गांवों में रहती है। अतः गांवों की उन्नति में ही राष्ट्र की उन्नति है। समस्याओं में ही हमें समाधान भी ढूंढना होगा, जैसे - 'दानव रूपी जनसंख्या को हम धनात्मक जन-शक्ति में बदल सकते हैं। इसके लिये हमें प्रत्येक नागरिक को सही मायने में शिक्षित कर उसे देश की मुख्य विकास धारा से जोड़ना होगा। स्वतन्त्रता प्राप्ति के लिए जिस प्रकार हम सब एक जुट होकर अंग्रेजों के विरुद्ध लड़े थे, ठीक उसी प्रकार एक बार फिर हमें एकत्रित होकर अन्तर्राष्ट्रीय मंच पर अपनी प्रौद्योगिकीय श्रेष्ठता सिद्ध करनी होगी। 'विकासशील भारत' को 'विकसित भारत' में बदलना होगा। तभी हर देशवासी को मिलेगा एक बेहतर जीवन-स्तर। 20 सितम्बर सन् 2004 को श्री हरिकोटा के सतीश धवन अन्तरिक्ष स्टेशन से प्रक्षेपित 'एजुसैट' (Education Satellite) इस दिशा में एक क्रान्तिकारी पहल है।

तपन कुमार मंडल

हिन्दी पखवाड़ा

प्रतिवेदन

इस वर्ष संस्थान में हिन्दी पखवाड़ा 15 सितम्बर-29 सितम्बर, 2004 के मध्य आयोजित किया गया, जिसमें संस्थान के समस्त अधिकारियों एवं कर्मचारियों ने रुचिपूर्वक सहभागिता की।

हिन्दी पखवाड़े का उद्घाटन समारोह संस्थान के मुख्य प्रेक्षागृह में 15 सितम्बर, 2004 को किया गया, जिसकी अध्यक्षता संस्थान की स्थानापन्न निदेशिका डॉ. (सुश्री) जयश्री बैनरजी ने की। समारोह के मुख्य अतिथि देश के जाने-माने गीतकार डॉ. कुँअर बेचैन थे। इस अवसर पर एक कवि सम्मेलन का आयोजन किया गया जिसका संचालन संस्थान के वैज्ञानिक डॉ. चन्द्रमोहन नौटियाल ने किया। कवि सम्मेलन का आरम्भ डॉ. चन्द्रमोहन नौटियाल ने अपनी सस्वर प्रस्तुति 'सूरज क्यों सोया है' के माध्यम से वर्तमान परिदृश्य पर टिप्पणी के साथ किया। संस्थान के ही डॉ. अल्पना, डॉ. ज्योत्सना, डॉ. नीरू, पुष्पेन्द्र तथा कैलाश चन्दोला ने भी अपनी रचनायें प्रस्तुत कीं। इसके पश्चात् संस्थान के सदस्यों तथा अतिथियों ने देश के सुविख्यात गीतकार डॉ. कुँअर बेचैन, डॉ. सुरेश, देवल आशीष, प्रीता बाजपेयी तथा हास्य कवि राजेन्द्र पण्डित को सुना तथा सराहा। जहाँ एक ओर कार्यक्रम के मुख्य अतिथि डॉ. कुँअर बेचैन ने 'चाँदनी चार कदम, धूप चली मीलों तक' की यथार्थवादी पीड़ा को शब्द दिए, राजेन्द्र पण्डित ने तुलसी दास के टी.डी. गोस्वामी में रुपान्तरण का उपहास करते हुए तथाकथित बुद्धिजीवी रचनाकारों पर भी कटाक्ष किया जिनकी रचना की विशेषता केवल उसकी दुरुहता होती है। प्रख्यात गीतकार डॉ. सुरेश की रेशमी आवाज में प्रस्तुत सस्वर रचनाओं ने श्रोताओं को मन्त्रमुग्ध कर दिया। प्रीता बाजपेयी के मुक्तकों को श्रोताओं ने जी भर कर सराहा। लखनऊ के देवल आशीष की मार्मिक रचनाओं से भावुक हुए श्रोता 'एक और' की पुकार करने को विवश हो गए। जहाँ एक तरफ उन्होंने 'अन्धेरा बाँटने वालों' की स्थली में डेरा डालने की पीड़ा को स्वर दिया, अलौकिक सौन्दर्य को परिभाषित करते हुए उन्होंने श्रोताओं के हृदय को छू लिया। अपने रचना पाठ में फिर डॉ. कुँअर बेचैन ने अपनी किशोरावस्था की रचनाओं से लेकर नवीनतम रचनाओं को सुना कर श्रोताओं को चाँद की टिकुली, तारों के मोती और पानी की कलाई के अलंकारिक सौन्दर्य की नगरी में घुमाते हुए सूखी मिट्टी में अश्रु तथा स्वेद के सम्मिश्रण से जनित क्षमताओं से रूबरू करा दिया।

हिन्दी पखवाड़े की श्रृंखला में, 20 सितम्बर 2004 को कम्प्यूटर में हिन्दी टंकण प्रतियोगिता को प्रथम सत्र में आयोजित किया गया जिसमें कुल 4 प्रतिभागियों ने भाग लिया। इस प्रतियोगिता में श्री राम उजागर ने प्रथम, श्री दीपक पाण्डेय ने द्वितीय तथा श्री अजय कुमार श्रीवास्तव ने तृतीय स्थान अर्जित किया। इस प्रतियोगिता की निर्णायक श्रीमती वी. निर्मला थीं। उसी दिन अपराह्न में दलगत आधार पर अंताक्षरी प्रतियोगिता हुई जिसमें 7 दल के 14 प्रतिभागियों ने भाग लिया। इस प्रतियोगिता में सुमित्रानन्दन पंत दल ने प्रथम स्थान अर्जित किया जिसके सदस्य डॉ. रश्मि श्रीवास्तव व डॉ. रजनी तिवारी थीं, बिहारी दल ने द्वितीय स्थान अर्जित किया जिसकी सदस्य श्रीमती रेनू श्रीवास्तव व श्रीमती शैल सिंह राठौर थीं तथा कबीर दल ने तृतीय स्थान अर्जित किया जिसके सदस्य श्री तपन कुमार मण्डल व श्री धीरेन्द्र कुमार पाल थे। इस प्रतियोगिता के निर्णायक डॉ. कृपाशंकर सारस्वत तथा डॉ. ऊषा सिन्हा थे। इसी श्रृंखला में, 22 सितम्बर को पूर्वाह्न में निबंध प्रतियोगिता आयोजित की गई। जिसमें श्री तपन कुमार मण्डल ने प्रथम, श्री धीरेन्द्र कुमार पाल ने द्वितीय तथा श्री सुबोध कुमार ने तृतीय स्थान प्राप्त किया। इस प्रतियोगिता

की प्रविष्टियों का जाँचने का कार्य डॉ. मोहित कुमार तिवारी तथा श्री के.के. अस्थाना ने किया। इसी दिन अपराह्न में गलती ढूंढो प्रतियोगिता आयोजित की गई जिसमें 16 प्रतिभागियों ने भागीदारी की। इसमें श्री अविनेश श्रीवास्तव व श्री पुष्पेन्द्र कुमार मिश्र ने संयुक्त रूप से प्रथम, श्री तपन कुमार मंडल ने द्वितीय तथा डॉ. (श्रीमती) नीरजा झा, श्री धीरेन्द्र कुमार पाल व श्री अविनाश श्रीवास्तव ने संयुक्त रूप से तृतीय स्थान प्राप्त किया। इस प्रतियोगिता के परीक्षक एवं निर्णायक डॉ. हरिकृष्ण माहेश्वरी थे।

27 सितम्बर को प्रश्न मंच प्रतियोगिता आयोजित की गई, जिसमें 15 प्रतियोगी 5 दलों के रूप में सम्मिलित हुए। इस प्रतियोगिता में पंचानन माहेश्वरी दल ने प्रथम स्थान प्राप्त किया जिसके प्रतिभागी डॉ. ए. रजनीकान्त, डॉ. रजनी तिवारी व कु. अनुपम जैन थे, होमी भाभा दल ने द्वितीय स्थान अर्जित किया जिसके सदस्य डॉ. राकेश सक्सेना, डॉ. ई.जी. खरे व श्री दीपक पाण्डेय थे तथा मेघनाद साहा दल ने तृतीय स्थान अर्जित किया जिसके सदस्य डॉ. आर.आर. यादव, डॉ. एस.के. बेरा व श्री अविनाश कुमार श्रीवास्तव थे। इस प्रतियोगिता के निर्णायक डॉ. जी.पी. श्रीवास्तव एवं डॉ. रमेश कुमार सक्सेना थे।

29 सितम्बर 2004 को हिन्दी पखवाड़े का समापन समारोह वाद-विवाद प्रतियोगिता के साथ आयोजित किया गया। जिसकी अध्यक्षता डॉ. (सुश्री) जयश्री बैनरजी ने की। इस समारोह के मुख्य अतिथि डॉ. आर.एन. लखनपाल थे तथा विशिष्ट अतिथि डॉ. मोहन बलवंत बाण्डे थे। वाद-विवाद प्रतियोगिता का विषय ''महिला आरक्षण उचित है'' था जिसमें कुल 7 प्रतिभागियों ने प्रतिभागिता की। इस प्रतियोगिता में डॉ. (श्रीमती) नीरजा झा ने प्रथम, डॉ. रमेश कुमार सक्सेना ने द्वितीय तथा श्री के.सी. चन्दोला ने तृतीय स्थान प्राप्त किया और 'अहिन्दी भाषी विशेष पुरस्कार' डॉ. ए. रजनीकान्त ने अर्जित किया। इस अवसर पर डॉ. बाण्डे ने संस्थान को 6 पुस्तकें उपहार स्वरूप भेंट कीं। अंत में संस्थान के कुलसचिव श्री सुरेश चन्द्र बाजपेई ने धन्यवाद ज्ञापित किया।

रतनलाल मेहरा

हिन्दी पखवाड़े के उद्घाटन समारोह में दीप प्रज्ज्वलित करते हुए सुविख्यात कवि डॉ. कुँवर बेचैन

हिन्दी पखवाड़े के कवि सम्मेलन में प्रसिद्ध कवि देवल आशीष

हिन्दी कार्यशाला

संस्थान के मुख्य प्रेक्षागार में 20 मई को हिन्दी सॉफ्टवेयर के कुशल उपयोग पर एक कार्यशाला आयोजित की गई। संस्थान में राजभाषा के उपयोग को प्रोत्साहित करने तथा हिन्दी में कम्प्यूटर पर कार्य करने को सरल बनाने के उद्देश्य से संस्थान के कम्प्यूटरों को द्विभाषी करने के इस चरण में 32 और कम्प्यूटरों में 'अक्षर फ़ॉर विन्डोज़' लगा दिया गया। इस सॉफ्टवेयर के उपयोग से रोमन लिपि में लिख कर भी हिन्दी में टंकण संभव होगा। व्यवसायिक प्रतिष्ठान के प्रतिनिधियों ने ई-मेल, शब्दकोष, बहु शब्द चयन तथा अन्य अनेक सुविधाओं का परिचय दृश्य-श्रव्य साधनों के उपयोग के साथ समझाया। श्रोताओं ने उपयोग के बारे में अपनी शंकाओं का समाधान भी किया।

इसी दिन तकनीकी सत्र से पूर्व एक आत्मचिन्तन पर व्याख्यान का आयोजन भी किया गया जिसमें अतिथि वक्ता गुरू सत्य गोविन्द जी ने आत्म चेतना की सोदाहरण मीमांसा करते हुए अपने आप को पहचाने का आह्वन किया। गुरू जी ने कहा कि हम प्रायः बाहरी आवरणों/गुब्बारों को अपनी पहचान बना लेते हैं जो सहज रहने में बाधक हैं। सुबोध हिन्दी तथा सरल शैली में उन्होंने अपने आपको पहचानने का महत्त्व समझाया।

कार्यक्रम के आरम्भ में संस्थान के निदेशक तथा राजभाषा समिति के अध्यक्ष डॉ. नरेश चन्द्र मेहरोत्रा ने अतिथि महोदय का स्वागत किया। समिति की संयोजिका डॉ. जयश्री बैनरजी ने सॉफ्टवेयर विशेषज्ञों के प्रति आभार ज्ञापन किया। डॉ. राहुल गर्ग ने अतिथि वक्ता गुरू सत्य गोविन्द जी का परिचय दिया तथा राजभाषा समिति के सदस्य-सचिव डॉ. चन्द्रमोहन नौटियाल ने कार्यक्रम संचालित किया।

चन्द्रमोहन नौटियाल

'नैनो फॉसिल'

नैनो फॉसिल - नैनो फॉसिल
तेरे अध्ययन से क्या हासिल
नैनो फॉसिल

तू पराप्लवक शैवाल, स्वर्ण
एक कोशी, नन्हें सुकुमार,
उत्ताल तरंगों, ज्वारों से
सागर सतहों पर है पसार
लेती कार्बन-डाई-ऑक्साईड गैस
देती आक्सीजन का भंडार।।
नैनो फॉसिल

सागर जीवन है अपरम्पार
तू पाँच-दस म्यू लघुरूप सरस,
पेट्रोलियम जनक का भी आधार
तेरे शरीर का अस्थिपंज
कैल्साइट मिनरल है साकार।।
नैनो फॉसिल

हैं समुद्र जगत के 'कोपीपोड'
आधारभूत भोजन प्रकार
तू आत्मसात होकर उनके
पाती तल विचरण अधिकार।।
नैनो फॉसिल

खोजें तेरी ट्रायसिक से अब तक
चूने के पत्थर में साकार
के/टी बाउन्ड्री के रहस्य कोष्ठ
की पर्त खोल हरता विकार।।
नैनो फॉसिल

सागरतल के अवसादों का
कुछ मिलीग्राम ही नितांत भार
उनकी आयु आकलनों में
नैनो फॉसिल का अद्भुत सार।।
नैनो फॉसिल

ज्योत्सना राय

'संकल्प'

हुआ व्याप्त चहुँ ओर प्रदूषण, होता जन-जीवन का शोषण
खोकर धरती अपनी हरीतिमा, पल-पल होती जाती बंजर।
धुएँ की विस्तृत चादर से, कलुषित होता है नीला अंबर
घुले जहर पानी में हर पल, विष होता निर्मल गंगाजल।

अब आने वाली पीढ़ी देखेगी, सूखे जंगल इस पृथ्वी पर
काली नदियाँ, काला अंबर, काले जल का बहता सागर।
हम कहते जल होता नीला, वो कहें नहीं यह तो काला
हम कहते नभ का रंग नीला, वो कहें नहीं यह भी काला।

सुषुप्त मानवों ! अब तो जागो, देखो यह तुमने क्या कर डाला
रंग-बिरंगी इस पृथ्वी को, बस काला ही काला है रंग डाला।
संकल्प हमें अब करना होगा, फिर पानी को नीला रंगना होगा
हरित वृक्ष और उज्ज्वल अंबर, वसुधा को रंगी करना होगा।

आओ ! हम मिलकर पुनः बसाएं, हरे-भरे वृक्षों के जंगल
मेघदूत फिर बरसें झम-झम, नाच उठे धरती का कण-कण।
आओ ! हम मिलकर पुनः बहाएं, नीले जल की कल-कल धारा
सुंगधित समीर से भरा आसमां, विविध रंगों से सजी धरा।

अल्पना सिंह

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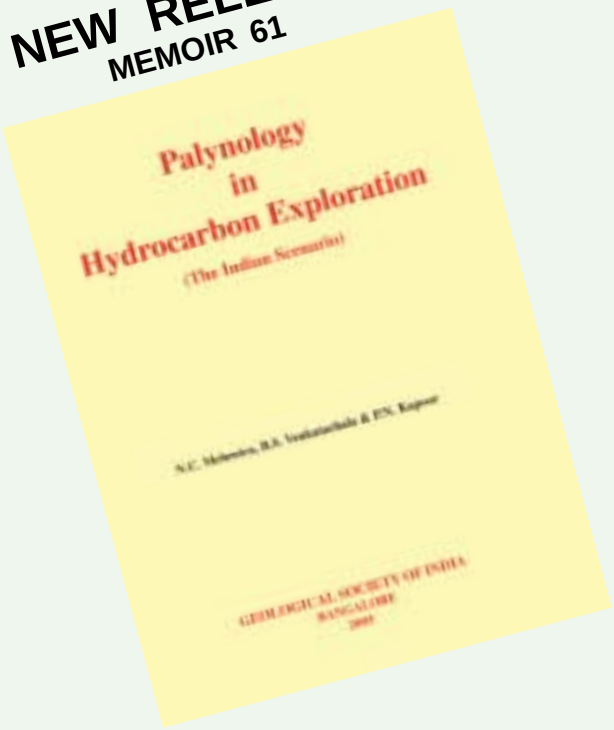

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With Best Compliments

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