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401, 41st Cross, 5th Block, Jayanagar
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Department of Botany
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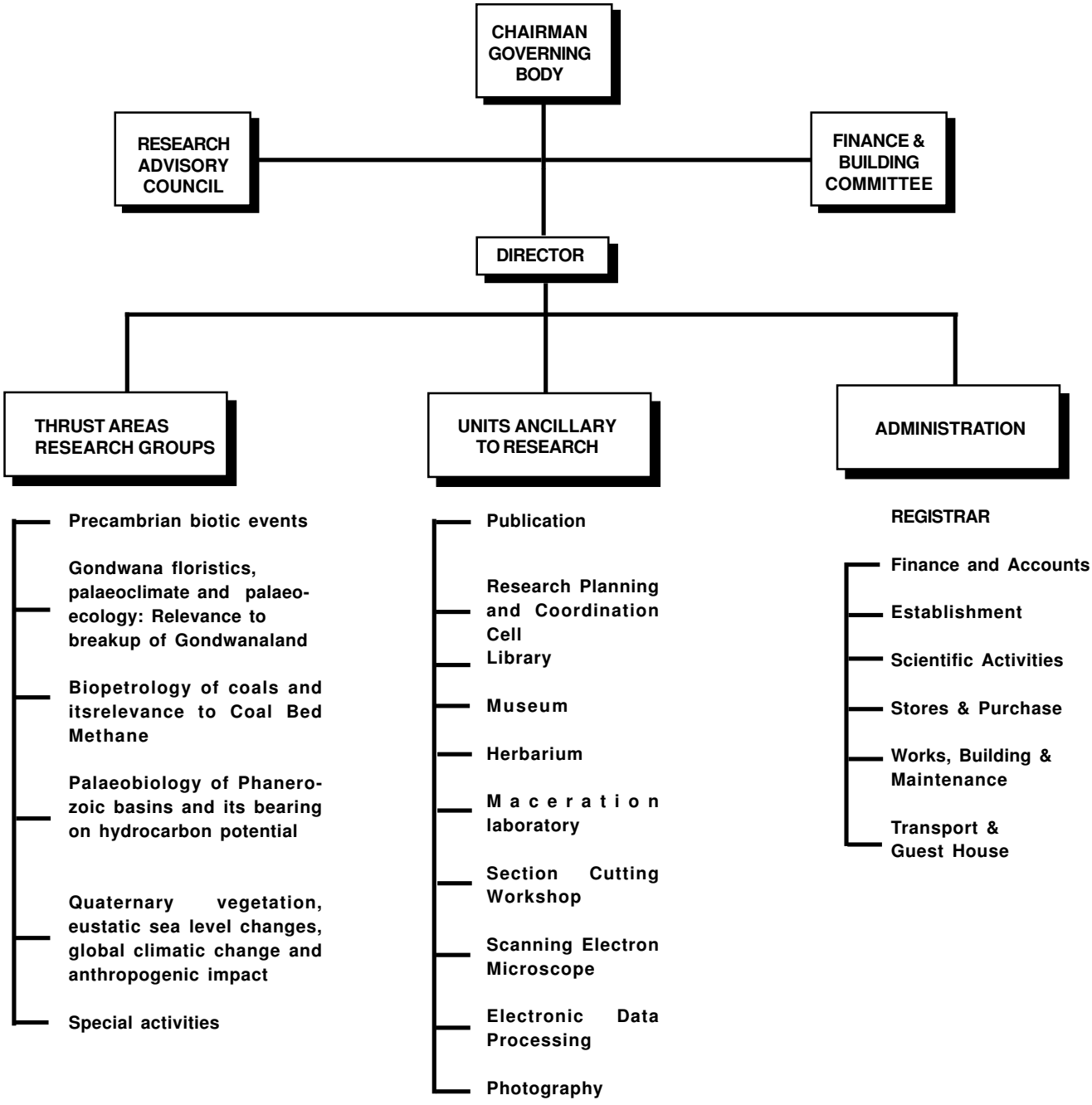


Research

Thrust Area: PRECAMBRIAN BIOTIC EVENTS

Project 1: Biodiversity and Sedimentary history in Meso-Neoproterozoic sediments of Vindhyan and Chhattisgarh Supergroups

Component 1: Biodiversity in Meso-Neoproterozoic sediments of the Vindhyan Supergroup

Reviewed existing slides in the museum and published data from Satna and Maihar areas. The study confirmed the presence of algal forms, viz., *Sphaerophycus*, *Myxococcoides*, *Gunflintia*, *Eomycetopsis*, and acritarchs, viz., *Protosphaeridium* and Leiospheridia from Maihar area. Presence of *Baltisphaeridium* could not be confirmed. The study of slides from Satna area revealed presence of both globular and filamentous forms, viz., *Sphaerophycus*, *Coleogloba*, *Myxococcoides*, *Vetronostocales*, *Gunflintia*, *Eomycetopsis*, *Amamikiea* and *Taeniatu*, and acritarchs, viz., *Protosphaeridium*, *Orygmatosphaeridium* and, *Kildinosphaera* and *Vavosphaeridium* were also found. Here too presence of *Baltisphaeridium* could not be conformed. Thus, none of the available forms of microfossils indicates an age younger than late Precambrian.

Fresh collection of samples from upper Vindhyan sediments exposed around Satna has been made. Stromatolites, viz., *Collenia symmetrica*, *Baicalia*, *Boxonia*, *Tungussia*, Oncolites and Stratifera have been recorded from Nagod Limestone and Stratifera and Oncolites have been recorded from Margadha Limestone Member.

Manoj Shukla

The Mesoproterozic Jaradag Fawn Limestone Formation (~1.6. Ga old) of the Semri Group contains abundant microfossils and precipitates in bedded, and stromatolitic early diagenetic cherts. 27 morphoforms covering 18 genera and 24 species were recognized which are parts of silicified lithologies including carbonate precipitates that were formed at or near the sediment-water interface as well as micritic event laminae that presumably lithified very slowly. The assemblage includes distinctive mat-forming entophysalidacean cyanobacteria. Ellipsoidal akinetes of nostocalean cyanobacteria (Archaeollipsoides) and spherical unicells also occur; both are allochthonous and possibly planktic. *Eoentophysalis* is the dominant organism in the assemblage and appears to have formed the laminae of stromatolitic chert. This organism is comparable to *Entophysalis* commonly found associated with modern stromatolites growing in arid, intertidal to supratidal habitat.

Petrological observations of Jaradag chert suggest that stratiform laminites, domes and microdigitate structures termed precipitates occur in its peritidal carbonates of Mesoproterozoic age. Silicified portions of these carbonates provide evidence of tufa or travertine-like precipitation in the form of (originally) aragonite sea floor cements, radial-fibrous fans and microlaminated laminae. There is no firm evidence of eukaryotic elements in the Jaradag assemblage but two different types of organisms, viz., *Clonophycus* and *Myxococcoides* have been interpreted as representing different modes of reproduction in coccoid prokaryotic or eukaryotic algae. This assemblage is well comparable with reported assemblages from peritidal environments of Canada, China and Russia.

Mukund Sharma

Component 2: Biodiversity in Meso-Neoproterozoic sediments of the Chhattisgarh Supergroup

Studied carbonaceous macrofossils comprising Longfengshanids, Tawuids and Chuarids from the Kodwa Formation (Raipur Group), exposed near Kodwa village, Durg District. Recovered for the first time

calcified mega remains comparable with extent genus *Gleotrichea*. Same samples were studied for organic-walled microfossils (OWM) by maceration residue. The assemblage is dominated by leiosphaerids. A few forms of *Tapania* like acritarch and cyanobacterial remains were also recorded. Recovered assemblage of macro- and micro-fossils indicates early Neoproterozoic age for the upper part of the Raipur Group.

Rupendra Babu

THRUST AREA: GONDWANA FLORISTICS, PALAEOCLIMATE AND PALAEOECOLOGY: RELEVANCE TO BREAKUP OF GONDWANALAND

Project 2: Floral evolution and Biostratigraphic significance in Damodar and Son-Mahanadi basins

Component 1: Palynostratigraphy and patterns of evolution in palynofloras through Permian and Mesozoic sequences in Damodar-Panagarh-Birbhum

Recovered rich spore-pollen assemblages in 500 m thick subsurface sediments represented by Barakar, Dubrajpur and Rajmahal formations from borehole DPD-6, Birbhum Coalfield. The uppermost part of Barakar Formation (308.00 - 300.00 m) is dated Late Permian in age. Subsequently overlying strata of Dubrajpur Formation (278.60 - 228.10 m) is equated to Middle Jurassic. The Intertrappeans of the Rajmahal Formation (175.60 - 33.00 m) range in time from earliest Berriasian to Barremian.

The data indicate the earliest eruption of lava flow i.e., earliest Berriasian in this area. Visited Birbhum Coalfield area and collected bore-core rock samples (drilled by GSI) from Tertiary and Gondwana (Rajmahal, Dubrajpur and Barakar) sequences.

Vijaya

Component 2: Floristics, biostratigraphy and palaeoenvironmental studies of the Gondwana sediments in Sohagpur Coalfield

Quantitative palynological analysis of borehole SJ-1 (2.00-247.60 m. depth) revealed the dominance of *Scheuringipollenites* in association with *Faunipollenites*, *Striatopodocarpites* and *Verticipollenites*, suggesting late Early Permian age. The palynofloral assemblage recorded in the borehole SNB-1 (722.00-1013.10 m. depth) is marked by the preponderance of non-striate disaccate palynotaxa, viz., *Alisporites*, *Falcisporites*, *Krempipollenites* and *Satsangisaccites* in association with *Densoisporites complicatus*, *Goubinispora morondavensis* and *Aulisporites sp*. Early Triassic age has been assigned to this assemblage. The sporadic occurrence of *Faunipollenites varius*, *Striatopodocarpites decorus*, *Crescentipollenites fuscus*, *Gondisporites raniganjensis* and *Arcuatipollenites pellucidus* etc. delimits the terminal phase of the late Permian. Collected more bore core and outcrop samples from the coalfield.

Ram Awatar

Component 3: Morphotaxonomy, floristics, evolution, biostratigraphy and palaeo-environmental studies of Ib-River Coalfield (Orissa) and Mand-Raigarh Coalfield (M.P.)

Processed remaining samples from boreholes OIOC-74 and 75 (drilled north of Brijoraj Nagar city, -(Belpahar area) and carried out scanning, photography and quantitative analysis of productive samples. Recovered palynofossils are grouped into two palynoassemblages from both the boreholes: i) Upper Barakar palynoassemblage, represented by *Faunipollenites* (dominant) and *Scheuringipollenites* (subdominant) which is assignable to late Early Permian age, and ii) Raniganj palynoassemblage dominated by

Striatopodocarpites followed by *Faunipollenites* with FAD's of *Arcuatipollenites diffuses* and *Krempipollenites indicus* indicating late Late Permian age. Further, visited Ib-river Coalfield for collection of more bore-core and surface samples for palynological investigation.

K.L. Meena

Component 4: Palaeofloral and dispersed organic matter characterization in Early Cretaceous deposits of central India

Studied conifer flora from Sehora (Satpura Basin) to evaluate morphotaxonomy and cuticular features under LM and SEM. These conifers include various species of *Pagiophyllum*, *Brachyphyllum*, *Elatocladus*, *Araucarites*, *Coniferocaulon* and *Satpuria.* The study reveals hypo- and amphistomatic nature of cuticles, with random or linear alignment of stomata within the stomatiferous bands. Stomata are mostly sunken, sometimes stomatal pits are covered with hairs suggesting xeromorphic adaptability of various taxa. This conifer assemblage is compared and correlated with other contemporaneous Gondwana deposits of India and abroad.

The carbonaceous shales, exposed along Machrar River, near Bansa contain rich organic matters, spore-pollen and leaf impressions and compressions. The organic matter is represented by structured terrestrial, biodegraded terrestrial, amorphous, black debris, etc. The transformation of structured plant pieces to nonstructural stage is a complex phenomenon performed under burial condition in which microbes and trace elements play an important role in their diagenesis. These processes have been studied with the help of SEM with EDAX. It is observed that such phenomenon is strongly influenced by various factors, viz., supply of organic/ inorganic matter, size of organic and sedimentary particles and microbial processes involved during sedimentation under fluvio-lacustrine regime.

Plant fossils were collected from various localities of South Rewa and Satpura basins. The sedimentary sequences contain carbonaceous shale, grey shale, siliceous and micaceous shale, white, reddish and dark brown clays, china clays and sandstones. Seven sections exposed along Machrar River around Bansa/Marwa ghats were traversed and collected plant fossils (*Gleichenia*, *Allocladus*, *Brachyphyllum*, *Pagiophyllum*, *Elatocladus Araucarites*, etc.). A good exposure is noticed along the Sher River near Sehora village (Narsinghpur District) and collected *Ptilophyllum* and associated taxa. The other sequences exposed along Chui Hill, Chota and Bara Simla in Jabalpur District yielded fragmentary specimens of *Pagiophyllum*, *Elatocladus*, *Araucarites* etc. Macerated and prepared cuticles of various specimens and processed samples for palynological and DOM studies collected from South Rewa Basin.

Madhav Kumar & Neeru Prakash

Component 5: Morphotaxonomy, floristics, biostratigraphy and palaeoecological studies in Korba and Hasdo-Arand coalfields

Cleared and identified around 80 megafossil specimens (impressions/compressions) from Manikpur and Kusmunda collieries of Korba Coalfield (Chhattisgarh). The genus *Vertebraria* and equisetalean stems were found in plenty in the flora. The overall megafloral assemblage is dominated by the genus *Glossopteris* and completely devoid of pteridophytic and coniferous elements (barring equisetalean stems). A few specimens of *Gangamopteris* and *Noeggerathiopsis* were also found. The plant taxa indicate Early Permian (Barakar Formation) age. Photography of important taxa has also been completed and the detailed study of the flora is in progress. The studies on the fossil flora from Mand-Raigarh Coalfield have been finalised.

Shaila Chandra & K.J. Singh

Visited Korba Coalfield area and collected above 300 megafossil specimens from five different collieries/ locations belonging to Barakar Formation.

K.J. Singh

Project 3: Vegetational patterns, Palaeogeography and Palaeoenvironmental analysis of Satpura-Wardha-Godavari and Gujarat-Rajasthan basins

Component 1: Palaeobotany, evolution, biostratigraphy and palaeoecology of Gondwana sediments of Wardha-Godavari Basin

Carried out chemical processing of samples (carbonaceous shales) of Raniganj Formation from Mailaram area of Godavari Basin. Megaspores belonging to six genera and nine species were recorded. The assemblage comprises species of a new alete genus *Kamthispora* (*K. raniganjensis, K. mailaramensis and K. ramanamurty*), besides trilete genera-*Bokarosporites rotundus*, *Banksisporites utkalensis*, *Singhisporites radialis*, *S. baculatus, Biharisporites spinosus* and *Ramispinatispora nautiyalii*. The recorded new genus *Kamthispora* may be a marker for late Permian Raniganj Formation. Finalized a paper on the aspect (jointly with Neerja Jha).

Described plant fossils, viz., *Glossopteris tenuinervis*, *G. subtilis, G. sastrii, G. stenoneura, Glossopteris sp.* from Barakar Formation and *Noeggerthiopsis hislopii*, *Glossopteris communis* and *G. stenoneura* from Raniganj Formation of Manuguru area (Godavari Graben). A list showing distribution of megafossils from different formations of Permian and Mesozoic of the graben is prepared and along with microfossils documented their occurrences in the form of a paper (jointly with Neerja Jha).

Carried out processing of plant megafossils - grouping, sorting, cleaning and identification from Kamthi Formation of Kamptee Coalfield (Wardha Basin). The megafossil assemblage comprises various species of *Glossopteris*, besides *Neomariopteris*, *Schizoneura*, seed impression and equisetalean axes. A field trip to Nagpur and adjoining areas was undertaken to collect plant megafossils from Barakar (*Glossopteris communis*, *G. stenoneura, Gangamopteris sp.* and equisetalean axes) and Kamthi (*Glossopteris indica, G. conspicua, G. damudica, G. rhabdotaenioides, G. stenoneura, G. tenuifolia, G. angustifolia, G. communis, Neomariopteris, Schizoneura* and equisetalean axes) formations of Kamptee Coalfield and Barakar Formation (equisetalean axes, *Glossopteris* species, *Noeggerathiopsis* compressions, and fructification genus *Scutum*) of Umrer Coalfield. Samples for microfossil studies were also collected from Chandrapur Coalfield.

Rajni Tewari

Component 2: Palynology of Gondwana sediments of central and southern parts of Godavari Basin and its phytogeographic significance

Palynological study carried out on megafossil bearing beds in Manuguru area revealed presence of three palynoassemblages. Palynoassemblage I recorded at 598-596 m. shows dominance of *Scheuringipollenites* belonging to Barakar Formation (early Permian). Palynoassemblage II (at 580 m) shows dominance of striate disaccates chiefly *Striatopodocarpites* and *Faunipollenites* and significant percentage of *Parasaccites* (12%). This palynoassemblage belongs to Raniganj Formation. Palynoassemblage III at 455-399 m also shows dominance of striate disaccates but high percentage of *Striasulcites* (up to 12%) and belongs to Raniganj Formation (Late Permian). Finalized megaspore study recovered from Late Permian sediments of Mailaram area, which includes *Singhisporites*, *Bokarosporites*, *Banksisporites*, etc.

Neerja Jha

Component 3: Biostratigraphy and palaeoenvironmental studies in Wardha and northern part of Godavari Valley Coalfield

Completed chemical processing and identification of palynotaxa from borehole JK-3 (Jena), Chandrapur District (Maharashtra). The study shows that palynoflora is dominated by *Striatopodocarpites - Striatites* along with *Densipollenites*, *Guttalapollenites* and *Corisaccites*, recorded in low percentages. Trilete spores are poorly represented. The palynoflora is comparable to Upper Permian palynoassemblage of Godavari and Damodar basins. Finalized a paper from Katol sub basin and Pirli Pavna area of Nagpur and Chandrapur on palynological correlation from scout bore core samples. Palynological reports have been submitted to GSI. Further, visited Ekarjuna and Chikkni areas (Chandrapur District), Wardha Valley and collected a number of borehole (drilled by GSI) samples for palynological correlation.

A.P. Bhattacharyya

Component 4: Morphological and evolutionary significance of Satpura Gondwana flora and their bearing in stratigraphy, palaeoecology and palaeoenvironment

Finalized the morphological and cuticular investigations of plant fossils collected from different collieries belonging to Barakar, Motur and Bijori formations. Two types of assemblage having affinity with the flora of Karharbari and Barakar are represented in the Barakar Formation. Similarly spore-pollen assemblage recovered from Motur Formation shows affiliation with the mioflora of Upper Barakar and Barren Measures formations. However, record of well preserved miofloras and fragmentary plant impressions of Bijori beds are comparable with the flora of Raniganj Formation.

The recovery of different types of cuticles from morphologically identical Noeggerathiopsis-leaves suggests that Noeggerathiopsis-leaves of Lower Gondwana belong to one species. It is advisable to describe leaves as cuticular morphotypes instead of designating separate species for leaves having different types of cuticles.

A.K. Srivastava

Component 5: Mesozoic terrestrial ecosystems of peninsular India

Undertook field trip to Pranhita-Godavari Graben and collected a number of impression, compression and petrified research material from the Mesozoic sediments. Preliminary investigations revealed diversity of gymnosperm dominant flora with local variations. Studied fossil leaves with elongated morphology probably belong to taxaceae. Preponderance of conifers particularly podocarpaceous leaf fossils is observed.

A. Rajanikanth

Component 6: Palaeofloristics of the Jurassic-Cretaceous sequences of Gujarat and Rajasthan

Prepared thin sections of the petrified wood remains collected from Ghursal and its adjoining area in Dhar District (MP), where Cretaceous sediments of Bagh Formation are exposed. These sections were studied under microscope. Unfortunately none of these woods show preservation good enough to carry out palaeobotanical studies. The plant fossil assemblages studied from two Fire Clay Quarries near Songadh, Surendranagar District were finalized. Undertook a field trip to 9 different Mesozoic fossil localities of Surendranagar and Kachchh Districts (Gujarat). Well preserved impressions as well as compressions comprising genera Isoetites, *Cladophlebis*, *Onychiopsis*, *Sphenopteris*, *Pachypteris*, *Ptilophyllum*, *Brachyphyllum*, etc. were collected from the Lower Cretaceous sedimentary sequences of Dhrangadhra and Bhuj formations, which are exposed in Surendranagar and Kachchh districts respectively.

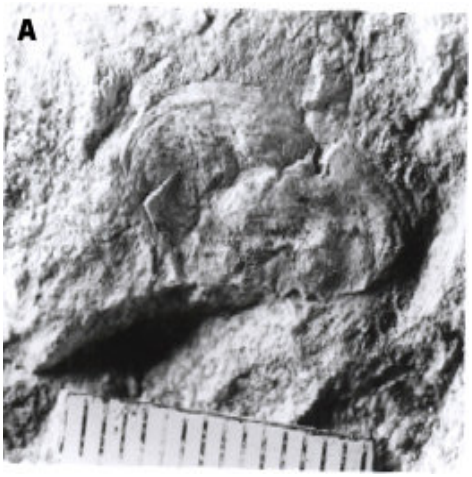
B.N. Jana

Project 4: Floral evolution and Biostratigraphy of Rajmahal Basin

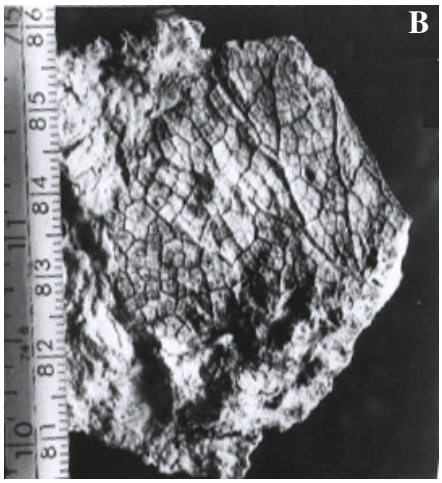
Component 1: Terrestrial megafloral change during Mesozoic in Rajmahal Basin

Investigations on the megafloral assemblage from Hiranduba locality of Rajmahal Formation have been carried out. The assemblage includes 13 genera belonging to various plants groups. The assemblage is represented by *Cladophlebis indica, Hausmannia crenata, ?Nipaniophyllum habsonii, Bucklandia sp., Ptilophyllum cutchensis, P. acutifolium, Williamsonia sp., Otozamites* sp. cf. *O. walkamotaensis, Dictyozamites falcatus, Anomozamites fissus, Coniferocaulon sp., Elatocladus confertus, E. tenerrimus, Brachyphyllum sp., Araucarites cutchense*, Araucarian cone and Molluscan bivalve shell. The overall assemblage suggests tropical-subtropical palaeoclimatic condition and in all probabilities the deposition took place in ephemeral conditions. Besides, evidence of root system with root nodules has been reported from the same locality. Occurrence of nodular root system indicates endotrophic symbiotic association of microbiota (cyanobacteria/fungi).

Jayasri Banerji & A.K. Ghosh



Bivalve (Molluscan shell) from Hiranduba locality, Rajmahal Formation



Hausmannia crenata from Hiranduba locality, Rajmahal Formation

Component 2: Biostratigraphy of Gondwana sediments in Rajmahal Basin

The palynological dating of the rock sequence in borehole RJKS-2 (436.00 m. deep) from Brahmani Coalfield, representing Rajmahal, Dubrajpur and Barakar formations have been done. The palynoflora is analysed to ascertain the occurrence and appearance of marker taxa- *Aequitriradites, Ruffordiaspora, Contignisporites, Januasporites, Foraminisporis, Triporoletes*, etc. and the species diversity. The palynofloras indicate Early Cretaceous age for Intertrappean bed and Middle Jurassic, Latest Jurassic and Early Cretaceous for the Dubrajpur Formation. Lithologically the upper part of Barakar Formation in this borehole comprising of dirty white medium grained sandstone interbanded with gray sandy shale is palynologically dated as Middle Jurassic in age. The Late Permian palynoflora is recovered from the underlying strata. The palynological data recovered from the Dubrajpur Formation indicating presence of Jurassic deposits in Rajmahal Basin was synthesised.

Archana Tripathi

THRUST AREA: BIOPETROLOGY OF COALS AND ITS RELEVANCE TO COAL BED METHANE

Project 5: Origin, Deal environment and Economic potential of Indian Coal and Lignite deposits

Component 1: Biopetrological and geochemical characterization of Indian lignites

Selected lignite samples from Gujarat were processed for geochemical studies. EDAX analysis of woody fragments have shown the enrichment of various elemental signatures, viz., C, O, Na, Mg, Si, S, Ca, Fe, Cu, V and Ti elements. Besides, occurrence of Cu and V in a few woody fragments are interesting. Further, a field work to Neyveli (Tamil Nadu) and adjoining areas was undertaken. Necessary collections from lignite seams were made through channel sampling methods. Overall 150 samples were collected. 10 woody samples were processed for geochemical investigations.

Rakesh Saxena

Component 2: Biopetrological investigations on coals of Wardha-Godavari Valley coalfields in relation to coal bed methane

Based on the maceral constitution, the Barakar coal seams (Lower Permian age) of Bhadrawati area of Wardha Valley Coalfield have been classified under vitric, fusic and mixed coal types. However, these coals in general have shown reflectance value (Ro max.) range from 0.53 to 0.56%. This indicates that the coals have attained high-volatile bituminous C Stage of rank.

O.S. Sarate

Component 3: Petrological evaluation of Rajmahal Basin coals in relation to economic potentiality and depositional history

Completed maceral analysis of the coals representing seams - I - V from Chuperbhita Coalfield. The coals contain variable proportions of reactive constituents (vitrinite 1-80%) with occasionally dominant non-reactives (inertinite 8-72%) and poor liptinites (up to 12%). In general the coals are of mixed types- vitrofusic (inertinite-rich) to fusovitric (vitrinite-rich). Rank values (Ro max. 0.43-0.56%) determined by reflectivity measurements indicate that the coals have attained sub-bituminous A to high-volatile bituminous C stages, immature for thermogenic coalbed methane generation.

On the basis of coal types, presence of well preserved cutinites (cuticles) and macrosporinite (megaspores) it appears that the coal seams have originated dominantly from hypautochthonous to autochthonous woody vegetation. Study also indicates rapid seasonal fluctuations with aerobic (dry-oxidative - inertinite-rich) to anaerobic (wet-reducing - vitrinite-rich) conditions.

Alpana Singh & B.D. Singh

Component 4: Petrological investigation of coals from Jhilimili-Sonhat-Sohagpur coalfields (Son Basin) in relation to coal bed methane and carbonization properties

Collected coal samples (lithology-wise) from Sohagpur (Kurja and Kapildhara mines) and Jhilimili (Katkona and Jhilimili mines) coalfields. Carried out measurements of lithotype bands and cleats in different working seam sections to assess the permeability of coal seams.

Sohagpur Coalfield- The thickness of working Seam A in Kurja Mine varies between 1.8-2.4 m. Excluding

bright and semi-bright bands, face cleats are ill-developed. Butt cleats in dull bands are widely separated and normally do not reach across lithotype bands. Interval between the cleats varies widely-3.96 cm-14.92, 21.0, to as much as 76.0 cm. The thickness of the Seam C in Kapildhara Mine varies from 2.0 to 4.5 m. Face and butt cleats are very well developed (32 cleats in 1.35 m/ 13 cleats in 83.0 cm) and spacing between the cleats varies from 0.52 to 4.85 cm and from 11.23 to 16.0 cm in 1.95 cm respectively.

Jhilimili Coalfield—The thickness of the Seam V in Katkona and Jhilimili mines respectively varies from 2.0 to 2.5 m and the cleats are very well developed. Major cleats run throughout the seam thickness (face and butt cleat: 37 in 80 cm bright and semi-bright bands; spacing: 0.35-1.20/1.50-3.80 up to 6.25 cm; 6-8 major cleats in 1.76-1.60 m) Secondary cleats are also present. Major cleats are across lithotypes with cleat spacing varying from 20 to 55 cm.

B.K. Misra, B.D. Singh & Alpana Singh

Component 5: Petrographic and cleat study of the Tertiary bright coals from Makum Coalfield, Assam in relation to CBM prospects

Study of micro-cleats and microstructures in non-banded Tertiary coals of Assam and Meghalaya was carried out, under normal incident mode, to ascertain the influence of different macerals on their nature and pattern. It was observed that the micro-cleats and microstructures, as expected, were more in the following order of abundance - vitrinite >inertinite >liptinite. In vitrinite, genetically controlled microstructures and micro-cleats were found along compressed tissue structures of uniform nature and also of different nature with irregular to sub-parallel in orientation. They are also produced by desiccation, tensional and compressive effects (crushing and brecciation) along liptinite and inertinite macerals without cutting them across, because of the latter's flexibility and strength. In liptinite and inertinite macerals micro-cleats are formed along their weaker zones.

B.K. Misra

THRUST AREA: PALAEOBIOLOGY OF PHANEROZOIC BASINS AND ITS BEARING ON HYDROCARBON POTENTIAL

Project 6: Palaeofloristics, Evolutionary trends and Palaeoenvironment of Late Cretaceous-Cenozoic basins

Component 1: Tertiary floristics of north-western peninsular India

Studied sections of a number of fossil woods from the Kankawati Series of Kachchh (Gujarat). The woods were found comparable to the woods of modern genera: *Terminalia, Cynometra, Millettia-Pongamia, Afzelia-Intsia and Sterculia* belonging to families Combretaceae, Leguminosae and Sterculiaceae. The woods indicate occurrence of conducive climate for the growth of these plants during Pliocene as none of them is represented in the natural vegetation of the region today. It is inferred from the occurrence of the fossil woods that conditions in Kachchh became drier after the Pliocene. Prepared manuscript of a paper on the fossil leaves from the Lower Tertiary of Barmer (Rajasthan).

J.S. Guleria

Component 2: Palynology, facies analysis, palaeoclimatic and palaeoenvironmental studies on Palaeocene-Eocene sediments in Rajasthan Basin

Completed palynological studies from Akli Formation exposed in Giral Lignite Mine, Barmer Basin. Out of 54 samples, 39 proved productive and good suits for palynofossils are represented by algal cysts, fungal remains, pteridophytic spores and angiospermic pollen. Angiospermic pollen are dominant in the assemblage and are followed by pteridophytic spores and dinoflagellate cysts. The assemblage is noticeably dominated by

monosulcate pollen possibly related to the family Arecaceae. Of these, four species have been assigned to *Spinizonocolpites*. These forms are related to modern brackish water palm, *Nypa*. Besides, the assemblage is also richly represented by *Kapurdipollenites gemmatus*, *K. baculatus* and *Retiverrumonosulcites barmerensis*. Other pollen genera in the assemblage, which also show affinity with Arecaceae are *Proxapertites*, *Palmidites* and *Palmaepollenites*.

The studied sequence is divided into two palynozones. Shale and bentonite with few bands of lignite mainly constitute the lithosuccession representing the Lower Palynozone, dominated mostly by *Lygodiumsporites eocenicus, Todisporites kutchensis, Dandotiaspora dilata, Proxapertites cursus* and *Retiverrumonosulcites barmerensis*. The Upper Palynozone is mainly represented by bentonite, shale and lignite sequences. Dominant taxa in this palynozone are- *Spinizonocolpites echinatus*, *Matanomadhiasulcites microreticulatus*, *Proxapertites cursus*, *Proxapertites microreticulatus*, and *Kapurdipollenites gemmatus*. Considering known ranges and frequencies of palynotaxa in assemblage the studied sequence is dated as Late Palaeocene in age.

S.K.M. Tripathi

Component 3: Tertiary floristics of peninsular India from Ratnagiri, Neyveli, Kerala, Bahur Basin (Pondicherry) and the adjoining areas

Carried out sectioning and preliminary investigation of 30 carbonised woods from Ratnagiri beds at Kalviwadi, Sindhudurg District (Maharashtra) and Payangadi Mines (Kerala). Tentative identification of 3 woods from Kalviwadi has shown that they belong to families Anacardiaceae, Dipterocarpaceae and Combretaceae. Structural details in other woods could not be observed due to poor preservation. Preparation of fossil cuticles and morphological/SEM studies of woods, fossil leaves, seeds/fruits and their photodocumentation from Ratnagiri beds and lignites of Kerala is in process. A fossil seed/fruit collected from Ratnagiri beds has been tentatively identified as *Terminalia* belonging to family Combretaceae.

Study of fossil leaves from Neyveli lignite (Tamil Nadu) is being finalized. Undertook a field trip to Ratnagiri and adjoining areas and collected a large number of plant megafossils (woods, seeds/fruits, leaves). Visited Central National Herbarium, Howrah for comparative study of fossil leaves and seeds/fruits with the modern ones.

Anil Agarwal

Component 4: Palaeofloristics of sedimentary sequences associated with Deccan Traps

Described fossil dicotyledonous wood and a fruit from Deccan Intertrappean sediments of Betul and Chhindwara districts (MP). The wood has been identified as *Lannea* (Anacardiaceae). The finding suggests antiquity of the genus to Maastrichtian-Danian. The wood of *Lannea* is so far reported from Miocene and Oligocene sediments of Assam and West Bengal. The fruit reported from Mohgaon Kalan, Chhindwara District belongs to the family Urticaceae showing probable affinity with *Boehmeria*.

Rashmi Srivastava

Component 5: Palynology of the Deccan Intertrappean sediments: Implication and correlation

Processed Intertrappean beds' samples exposed in isolated patches around Gurmatkal, Gulbarga District (Karnataka). All the samples contain organic matter but volcanic ash and carbonaceous sediments contain palynomorphs. Recovered assemblage contains angiospermic and (rare) gymnospermic pollen, pteridophytic spores, fresh water and marine algal representatives, fungi and foraminifera. The assemblage is marked by the common occurrence of Maastrichtian markers, viz., *Gabonisporites*, *Ariadnaesporites*, *Mulleripollis*, *Azolla* and *Triporoletes*. Presence of foraminifera and marine algal cysts indicates marine influence in these lacustrine deposits of the Deccan Intertrappean. Study on Intertrappean sediments from Naskal (Andhra Pradesh) revealed presence of diatoms belonging to the genera *Nitzschia*, Rhizopod

(Thecamoeba), *Planothidium* etc. These genera form one of the oldest records and are characteristic of small freshwater bodies. Based on the modern ecology of the taxa it is assumed that the sediments were deposited in a circumneutral to slightly acidic bog or mire, perhaps a small fresh water pond. Collected rock samples from the Deccan Intertrappean and Lameta Formation from areas around Jabalpur.

R.S. Singh

Component 6: Evolution and diversification of the flowering plants in the Assam-Arakan Basin during Tertiary

Finalized a paper based on the cuticular fragments collected from the Barail sediments of the Makum Coalfield. Several plant remains were systematically described from the Barail sediments of Mizoarm. Besides, a new leguminous fruit was also described from the Middle Bhuban Formation of Aizawl. In addition, a large number of plant remains were collected from the Oligocene sediments of the Makum Coalfield (Assam).

R.C. Mehrotra

Component 7: Study on Tertiary plant megafossils of north-west Himalayas

Cleared, photographed and identified some leaf remains from the Kasauli and Dharamsala sediments of Himachal Pradesh. A manuscript on the identified leaves of *Terminalia* and *Lasianthus* belonging to families Combretaceae and Rubiaceae has been prepared. In addition two woods showing resemblance with the modern woods of *Terminalia* and *Dipterocarpus* have been identified. A paper dealing with these woods has been finalized.

J.S. Guleria & Rashmi Srivastava

A. Fossil leaf of *Semecarpus* from the Kasauli Formation (Early Miocene), Himachal Pradesh (Natural Size).
B. A Modern leaf of *Semecarpus anacardium* showing similar shape, size and venation (Natural Size).

Component 8: Siwalik foreland basin: Floristics, evolutionary pattern and climate

The study on plant fossils from Bilaspur and Ranital revealed the presence of 10 fossil taxa, hitherto not reported from Siwaliks of Himachal Pradesh. These are comparable to extant taxa: *Fissitigma wallichii* (Anonaceae), *Cratoxylon pruniflorum* (Clusiaceae), *Flacourtia ramontchii* and *Hydnocarpus alpinus* (Flacourtiaceae), *Anisoptera curtisii* (Dipterocarpaceae), *Trichilia coronoides* (Meliaceae), *Meliosa pinnata* (Sabiaceae), *Millettia pachycarpa* (Fabaceae), *Ficus benjamina* (Moraceae) and *Amesoneuron* (Palmae). Most of the species resembling fossils are presently distributed in the tropical evergreen to moist deciduous forests of Western Ghats, NE India, Myanmar and Malaya regions.

Investigated plant megafossils from Lower Siwalik sediments of Tanakpur (Uttaranchal), which reveals the presence of some more taxa showing their close resemblance with the extant taxa *Ellipeia cuneifolia* (Anonaceae), *Commiphora caudata* (Burseraceae), *Caesalpinea microphylla*, *Millettia atropurpurea* (Fabaceae), *Cinnamomum caudatum* (Lauraceae) and *Diospyros ebenum* (Ebenaceae). The habit, habitat and distribution of modern equivalent taxa indicate that medium to broad-leaved evergreen to moist deciduous elements were flourishing around Tanakpur area in contrast to mixed deciduous elements at present. Collected plant megafossils (leaf and fruit impressions) from a well-exposed Siwalik section in Tanakpur area. Collection of palaeosol samples from Lower and Middle Siwalik sediments of Purniyagiri area has also been made for their isotopic analysis. The lithocolumn of the section was revised and samples were collected accordingly.

Mahesh Prasad

Component 9: Neogene of sub-Himalayas of Arunachal Pradesh: Palynostratigraphy, floristic pattern and climate

Studied palynology of the Kimin Formation exposed on Likabali- Along Road, West Siang District. The important palynofossils recovered are mainly *Todisporites, Cyathidites, Striatriletes, Malayaeaspora, Polypodiaceaesporites, Frasnacritetrus*, besides reworked Permian palynofossils like *Rhizomaspora*, *Indotriradites*, *Platysaccus*, *Verticipollenites*, *Primuspollenites*, *Plicatipollenites*, etc. The distribution of the families in the assemblage indicates that the area enjoyed tropical to subtropical, warm-humid climate at the time of deposition of Kimin Formation. The basin in which these sediments were deposited had connections with fresh water swamps with ponding conditions nearby. Presence of reworked palynofossils indicates that the Lower Gondwana sediments were exposed nearby and were the source rocks for the younger Tertiary sediments. Presently, the Permian sediments are well exposed to the north of the studied area.

G.K. Trivedi

Project 7: Palynostratigraphy and Palaeoenvironment of Cenozoic basins of peninsular India

Component 1: Palynological investigation of the Eocene sediments of Shillong Plateau

A field work was undertaken for collection of samples from the Kopili Formation exposed in North Cachar Hills (Assam). Traverses were undertaken in the area between Umrongso and Khorungma (on Umrongso-Haflong Road) to understand the stratigraphic set-up of the area. Altogether, 121 samples were collected from two localities. 33 samples, collected from the Kopili Formation exposed along 9 km Labang Track, were macerated. Scanning of slides, photodocumentation and study of palynofossils have been taken up. The important palynotaxa recorded are: *Striatriletes susannae, S. multicostatus, Intrapunctisporis intrapunctis, Polypodiisporites mawkmaensis, Spinizonocolpites echinatus, Densiverrupollenites eocenicus, Pellicieroipollis langenheimii, Tricolporopollis matanomadhensis, Palmaepollenites nadhamunii, Triporopollenites sp*., etc.

R.K. Saxena & G.K. Trivedi

Component 2: Palynological study of Tertiary sedimentaries and its bearing on the evolution of palynoflora of Kachchh Basin

Completed palynological study of Naredi Formation (early Eocene) sediments exposed in a nala section near Matanomadh village. *Retitrilatiporites*, *Spinizonocolpites* and *Minutitricolporites* dominate the palynoassemblage in the lignite containing lower part of the section, while the upper part shows high frequency of *Margocolporites* and *Meliapollis*. The frequency of spores-pollen and fungal remains decreases gradually from the base to top of the section. Dinocysts very poorly represent the assemblage resembling Panandhro main

lignite mine palynoflora. Interestingly, the palynotaxon *Dakshinipollenites* is recovered from here, which is earlier, reported from Neyveli lignite field. Good representation of taxa like *Retitrilatiporites*, *Spinizonocolpites*, *Minutitricolporites*, *Meliapollis*, *Lakiapollis* and *Triangulorites* indicate presence of swampy condition at deposition site. Rich fungal elements point out warm and humid climate.

J.P. Mandal

Component 3: Tertiary palynostratigraphy and palaeoecology of east coast of India

Carried out laboratory processing of samples (20) belonging to Kallankurichi and Sillakudi (Ariyalur Group) formations. Scanning, photodocumentation of selected taxa have been done. Morphotaxonomy and identification of spore-pollen recovered from Sillakudi area were taken up and continued.

A field work was undertaken to study and collect various rock samples from Cretaceous-Tertiary sediments exposed at Ariyalur and adjoining areas; Neyveli lignite field (Tamil Nadu) and Thondamanattam and adjoining areas (Pondicherry). Collected 235 samples from Ariyalur and adjoining areas (Niniyur village, Adnankurichi and Periakurichi Limestone Mines, Kallamedu Section, China-Anandawadi, Cholankurichi, Kallankurichi Limestone Mines, Peria Nagalur Mines); Neyveli lignite (mines I and II) and Pondicherry (Thondamanattam and Saderpeta) for palynological investigation. Thickness, lithology and fossil contacts of these formations were studied and their contacts with the adjacent formations were located.

M.R. Rao

Component 4: Palynostratigraphy and palynofacies analysis of Tertiary sediments of Upper Assam Basin

Palynological and palynofacies studies from the sediments exposed at river cutting near Barpatahar, Upper Assam has been done. The quantitative analysis exhibits that dinoflagellate cyst of *Homotryblium* sp. is dominant along with *Apectodinium* and some pollen taxa (*Lanagiopollis* spp. *Neocouperipollis kutchensis*, *Matanomadhiasulcites maximus* and *Proxapertites* spp.). The frequency variation in palynofacies as well as sporomorph/plankton ratio has been studied with respect to their stratigraphic distribution. The palaeoecological significance of spore-pollen assemblage and organic matters is assessed on the basis of their relative abundance in each sample. It is suggested that these sedimentary sequences were deposited under redox condition at marginal marine site. The palynoflora indicate tropical climate during Early Eocene. Also macerated about 30 samples from subsurface deposits belonging to Langpar, Therria, Lakadong and Kopili formations of the boreholes- Bhekulajan#1, Borhapjan #1 and Jeraipathar of Upper Assam.

Madhav Kumar

Component 5: Palynological investigation of Miocene sediments of Tripura and Mizoram

Recorded a rich palynological assemblage from the Middle Bhuban Formation of Saiha area, Chhimtuipui District, Mizoram. The palynoassemblage comprises 35 genera and 45 identifiable species and is dominated by the angiosperm pollen followed by pteridophytic spores. Gymnosperm pollen are scantily represented. Fungal remains have also been recorded. The characteristic palynofloral elements are *Pteridacidites*, *Dictyophyllidites*, *Striatriletes*, *Polypodiaceaesporites*, *Tricolporopollis*, *Plumbaginacipites*, *Retitrescolpites*, *Hibisceae-pollis*, *Malvaceaerumpollis*, etc. The present day distribution of various plant families and abundance of fungal remains indicate tropical to subtropical, warm humid climate during the time of deposition. The poor representation of dinoflagellate cyst, pollen of mangrove and coastal element like *Spinizonocolpites* suggest that the sediments were deposited in the delta distributaries channel in the proximity of shoreline.

B.D. Mandaokar

Project 8 : Marine Micropalaeontology of Mesozoic-Cenozoic basins: Implications on Palaeoenvironment and Sea Level changes

Component 1: Jurassic nannofossils from western Indian continental shelves and their palaeobiogeographic implications

Nannofossil assemblage recovered from the basal part of the Kuldhar Member (Section KD) is well diversified and moderately preserved. Nannofossils are present throughout the section. The assemblage consists of 32 species, and is dominated by variable sized members of family Watznaueriaceae. Occurrence of *Ansulasphaera helvetica*, *Stephanolithion bigoti*, *S. hexum*, *S. octum* and *S. speciosum* permits calibration of *Ansulasphaera helvetica* Zone (NJ 12) and *Stephanolithion bigotii* Zone (NJ 13) of Bown and others of early Callovian age. The Kuldhar nannofossil assemblage shows close comparison with that recorded from Jara Dome in Kachchh and East Karakoram Block revealing an event of continued Callovian transgression in the Indian subcontinent.

The nannofossil assemblage though lacking discoasters and rhabdosphaerids contains abundant reticulofenestrids and on the basis of marker taxa, viz., *Cyclococcolithus formosus, Helicosphaera recta, H. heezenii, Sphenolithus predistentus, Reticulofenestra umbilica* is assigned to NP 22/ NP 23 Helicosphaera reticulata Zone of Martini, 1971, corresponding with CP 16/ CP 17 Zone of Okada & Bukry, 1980 and NN To 3 to NN To 7 Zone of Varol, 1998. Presence of cosmopolitan markers places the assemblage well within Rupelian chronostratigraphic division. Large sized *Pemma* spp. is attributed to be reworked from Harudi and Fulra Limestone formations of Bartonian age. Priabonian is a hiatus in Kachchh basin. The assemblage is indicative of shallow, near shore and warm water environment of deposition with a tropical setting.

Jyotsana Rai

Component 2: Micropalaeontology of fossil algae from Late Cretaceous-Early Palaeocene sequence of Cauvery Basin

Examined petrographic thin sections of limestone samples from the Cretaceous-Tertiary sequence of Vriddhachalam (TN) and Pondicherry areas for the morphotaxonomic study of calcareous algae. For the first time geniculate coralline algae have been recorded from the Patti Formation (Campanian) of Vriddhachalam area (Cuddalore District). Non-geniculate coralline algae belonging to subfamilies Sporolithaceae and Melobesioideae have been identified from the Karasur Formation (Palaeocene) of Pondicherry area. In addition, analysed the impact of end Cretaceous mass extinction event on the diversity of benthic calcareous algae from India. Finalised a paper on corallinacean and halimedacean algae from the Neogene sediments of India and their implications on palaeoenvironment.

A.K. Ghosh

Component 3: Dinoflagellate cysts and palynofacies study of the Upper Cretaceous-Palaeocene succession of the south Shillong Plateau: Implications to palaeoenvironment and relative sea level changes

Carried out dinoflagellate cysts and palynofacies studies from Tura-Dalu Road and Dilni River sections (Garo Hills). Samples from Tura, Siju Limestone and Rewak formations proved productive. Rich and diversified dinoflagellate cyst assemblages of Lower-Middle Eocene (Ypresian-Bartonian) age are recorded in association with rich terrestrial organic matter. Significant variations in dinocyst/organic matter distribution in the vertical section are recorded. Photodocumentation and morphotaxonomic study of the dinocyst assemblages have been carried out. Significant dinocyst taxa recorded are - *Areosphaeridium diktyoplokus, Cordosphaeridium exilimurum, C. fibrospinosum, Dammasadinium impages, Diphyes*

colligerum, D. spinulum, Enneadocysta arcuata, Hemicystodinium sp., Hystrichokolpoma unispina, Hystrichosphaeridium tubiferum, Lingulodinium macherophorum; Melitasphaeridium cf. asterium, Operculodinoium major, Polysphaeridium subtile, Spiniferites ramosus and Turbiosphaera symmetrica.

Dinoflagellate cyst assemblage from the coal-bearing Lakadong Sandstone exposed at Jathang (Mawsynram area, Khasi Hills) shows low diversity with high numerical abundance of wetzelielloid taxa predominated by *Apectodinium*, *Wilsonidinium*? and *Rhombodinium*? species. Other significant taxa are-*Adnatosphaeridium multispinosum*, *Diphyes colligerum*, *Operculodinium centrocarpum*, *Polysphaeridium subtile*, *Thallasiphora pelagica* and *Glaphyrocysta cf. ordinata*. Age of the assemblage is concluded to be Late Thanetian based on the occurrence of A. homomorphum, *A. paniculatum* and *A. parvum* comparable with the assemblage recorded from the adjoining Cherrapunji Plateau. Occurrence of new wetzelielloid taxa showing close morphological similarity with those reported from Kazakhastan is considered to attest to their widespread distribution related to the LPTM event. Finalized a paper entitled "Significant Dinoflagellate cyst biohorizons in the Upper Cretaceous-Palaeocene succession of the Khasi Hills, Meghalaya".

Rahul Garg, Khowaja Ateequzzaman & Vandana Prasad

Component 4: Palynostratigraphy and palaeoenvironment analysis of the Lower Tertiary rocks, N-W Himalayas: Implication to palaeoclimate and foreland basin evolution

Processed 65 samples from Lower Dharmsala and 20 from Upper Dharmsala formations from Bilaspur-Ghagas road and Brampokhar-Deoth road sections, respectively, out of which 10 samples are proved productive. The Lower Dharmsala palynofloral assemblage is mainly composed of fungal spores and microthyraceous ascostromata, pteridophytic spores and angiospermous pollen. Significant taxa of the palynoflora have been compared to those of the extant members of the families, viz., Cyatheaceae, Dicksoniaceae, Osmundaceae, Schizeaceae, Parkeriaceae, Polypodiaceae, Arecaceae, Poaceae, Sapotaceae and Mimosaceae. Bisaccate pollen grains belonging to the family Pinaceae are abundant in the samples of Upper Dharmsala Formation.

Samir Sarkar

Continued work on exceptionally well preserved Cyanobacteria rich sediments from 10 m thick calcareous shales and silty shales of the basal part of the Subathu Formation (Late Thanetian-Early Ypresian), exposed near Nilkanth area (Uttaranchal). Three types of Cyanobacterial fabric were documented in this sequence-Microbial mats, Microbialites, and Cyanobacterial nodules. Generated data clearly indicate that these sediments were laid down during exceptionally warm and humid interval in a protected area of low relief intertidal-supratidal region of Subathu epicontinental sea.

An attempt has also been made to reconstruct palaeo-oxygenation level of the Subathu epicontinental sea during Late Ypresian-Lutetian time on the basis of distribution of palynofacies in Kharak stratigraphic section of Morni Hills, Haryana. The relative abundance of *Thalassiphora pelagica* has been used as proxy to assess oxygenation both at sediment surface interface and in the water column. Study indicates that low oxygen level and eutrophic conditions were formed due to stratification of water column during shallowing of the Subathu epicontinental sea in the area of investigation.

Samir Sarkar & Vandana Prasad

Undertook a field work on Saurashtra coast for recent analogue study and collected samples from various environments, e.g., lagoon, proximal and distal part of esturies, saltpans, brackish water lake and tidal flat area. Extensive microbial mats have been recorded from mud flats of intertidal regions near Dwarika and lagoonal areas near Diu. Microbial mats covering a partially inundated mudflat near Dwarika show presence of seven types of Cyanobacteria belonging to genera *Lyngbya*, *Microcoleous*, *Oscillatoria*, *Phormidium*, *Xenococcus* and *Chroococcus*. These mats are vertically stratified although to different degrees and thickness ranged from 1-30 mm. Most mats had an upper green gelatinous layer and a lower reddish layer. Extensive extracellular polymer

production was present in all mat types. Presence of aragonite in these mats is indicative of hypersaline conditions of the environment.

Vandana Prasad

Project 9 : Palaeofloristics and Palaeoclimate of Andaman and Nicobar Basin

Component 1: Neogene microfloristics of Andaman and Nicobar Islands and their stratigraphic sequence

Continued studies on different siliceous microfossil groups, viz., silicoflagellates, diatoms, sponge spicules, Actiniscus, Archaeomonodaceae, phytoliths and radiolarians from Miocene-Pliocene deposits of Neill and Havelock islands. Microfossils from East Coast and Nipple Hill sections (Miocene-Pliocene) of the Neill Island were quantitatively studied. Members of 9 microfossil groups were identified amongst the siliceous skeletal remains. These are sponge spicules (zoobenthos), benthic diatoms (phytobenthos), radiolaria, ebridians and actiniscids (zooplankton) and diatoms, silicoflagellates and archaeomonadaceae-resting spores of Chrysophyceae (phytoplankton). Phytoliths, a rare input from the terrestrial sources were also encountered. Approximately 300 diatom valves per sample were counted from both sections followed by determination of the percentage frequency of selected diatom taxa. The siliceous microfossils reflect an open marine depositional environment with input from habitats in and around oceanic islands. Studies on a detailed account of the diatom species, their full taxonomic treatment and their abundance in these deposits are continuing.

Studies on calcareous algae from the Middle Pliocene (Kakana Formation) and from the Late Middle Miocene (Hut Bay Formation) of the Car Nicobar and Little Andaman islands respectively have resulted in the completion and finalization of two papers (jointly with R.K. Saxena & A.K. Ghosh).

Palynological studies of the Baratang Formation (Eocene) from the Andaman and Nicobar Islands have been completed and a manuscript on the same has been finalised (jointly with J.P. Mandal & A.P. Bhattacharyya).

Anil Chandra

Component 2: Palaeomangroves and palaeoclimate in Andaman and Nicobar Islands during Quaternary period

The manuscript of paper entitled 'A' 3,600 years record of vegetation and sea level changes from a Quaternary section of Little Andaman, India is under finalization. It includes the result of 34 samples, collected from exposed Quaternary section (BS-1595, 36,550 ± 870 years B.P.) measuring 25 ft. in height from R.K. Puram, Little Andaman. Based on high pollen frequency of both core and peripheral mangroves along with associated palynodebris, seven periods of marine transgression have been identified. Out of these, three palynological zones viz., RK-2 (31,500 - 27,500 years B.P.), RK-6 (18,000 - 13,500 years B.P.) and RK-8 (4,500 - 1,000 years B.P.) are well demarcated. Presence of drifted and reworked pollen are also observed in some of the samples. The rapid sea level rise during early Holocene is well documented whereas sea level changes during late Holocene is difficult to be interpreted qwing to geophysical disturbances and anthropogenic activities.

Asha Khandelwal

THRUST AREA: QUATERNARY VEGETATION, EUSTATIC SEA LEVEL CHANGES, GLOBAL CLIMATE CHANGE AND ANTHROPOGENIC IMPACT

Project 10: Quaternary vegetation, Palaeoclimate and Palaeoseismisity

Component 1: Pollen analytical studies in Rajasthan lake sediments to reconstruct vegetational history and climatic changes during LGM

The component was continued up to July 2002. During the period, carried out pollen analysis of 6 samples from sedimentary core from Sambhar Salt lake. Studies of 4 productive samples from different depths have revealed open type vegetation, dominated by Poaceae and Cyperaceae followed by *Artemisia*, Cheno/Ams, Urticaceae, Capparidaceae, *Polygala*, *Prosopis*, Fabaceae, Oleaceae, *Ephedra*, *Holoptelea*, Moraceae, Tiliaceae, Myrtaceae, etc. Exotics such as *Pinus*, *Abies*, etc. are also recovered.

Chhaya Sharma

Component 2: Studies on palaeovegetational and palaeoclimatic changes in Madhya Pradesh using pollen proxy records

Completed pollen analysis of a 2 m deep sediment core from Kiktiha Swamp, Shahdol District. The pollen sequence has shown that around 1500 to 1050 yrs BP, the tropical deciduous sal forests chiefly constituted of *Shorea robusta*, *Madhuca indica*, Sapotaceae, *Lagerstroemia*, *Aegle marmelos* and *Mitragyna* in the region under warm and moist climatic conditions. Around 1050 to 600 yrs BP, these forests turned less diversified as evidenced by the absence of *Shorea robusta* and reduced frequencies of its associates in response to prevalence of warm and less moist climate. Since 600 yrs BP onwards, the improvement in *Shorea robusta* and other associates such as *Madhuca indica*, *Lagerstroemia*, *Terminalia*, *Syzygium*, etc. envisages onset of warm and more-moist climate.

Collected 8 sedimentary profiles comprising 5 from Shahdol District and 3 from Umaria District for Quaternary palynological investigation. Besides, 29 surface samples (sediments and moss cushions) were also picked up from teak and sal forests to study modern pollen deposition pattern in the region.

M.S. Chauhan

Component 3: Studies on Quaternary vegetation and climate of western Himalayas

Carried out geochemical investigation of profile TT-II (110 cm deep) from temperate site Talli Tal, Kumaun Himalaya. Weight loss on ignition showed that during Middle Holocene area had poor organic matter, low moisture and sufficient carbonates- reflecting poor vegetation and dry climate. At the onset of Late Holocene the percentage of organic matter and moisture increased to nearly double, while of carbonates remain more or less same to slightly increased. Such changes continued onwards, indicating establishment of thick vegetation and humid climate during Late Holocene. The bio-assemblage recovered consists of palynomorphs of a large number of plant taxa (*Quercus*, *Pinus*, *Ulmus*, *Picea*, *Carpinus*, Urticaceae, Poaceae, Cyperaceae, Cheno/Ams, Tubuliflorae and Liliaceae, etc.), which broadly reflects presence of mixed oak forest with temperate warm climate. Lithologically, profile in question is largely comprised mainly of silty/sandy clay and pebbles with charcoal pieces in upper 3/4th part- reflecting that natural disturbances occurred at the region since Middle Holocene (i.e. beginning of sequence) and forest fire during Late Holocene.

Analysed 6 samples of profile ST-I (3.5 m deep) from another temperate site Sukha Tal. The palynoassemblage shows dominance of nonarboreals over arboreals. Among arboreal *Quercus, Alnus, Betula, Carpinus, Ulmus*, Ericaceae, *Celtis, Salix, Pinus, Picea* and *Ephedra* are main elements. Poaceae, Cyperaceae, Cheno/Ams, Caryophyllaceae, Ranunculaceae, Polygonaceae, Brassicaceae, Apiaceae, *Artemisia* and Tubuliflorae represent nonarboreals. Cryptogamic spores and fungal remains are encountered in all samples but aquatics show restricted distribution. Frequency of different elements shows interesting change with change in depth. Vegetation scenario broadly reflects presence of mixed oak forests with fluctuating warm and humid climate at the region. Prepared draft of a paper dealing with Holocene molluscs from Kumaun Himalaya. Also prepared note on natural disturbances (particularly neotectonic once) at Kumaun Himalaya.

Asha Gupta

Component 4: Palaeoclimatic studies in Schirmacher Oasis, east Antarctica using palynological as well as chronological parameters

Palynological study of moss peat samples (10) from 2 km SW of Trishul Hill and frozen soil samples (4) from pattern ground in Schirmacher Oasis depict poor occurrence of long distance transported higher plant taxa, however algal elements and bryophytic spores are suggestive of local origin.

Analysed 8 lichen patches (5 crustose & 3 foliose) for palynological investigation from the oasis in East Antarctica. Out of the whole lot soil from foliose forms reveals the occurrence of grasses, herb and very few arboreal taxa along with *Cosmarium*, algal cysts, diatom, acritarchs, fungal remains and other varia in low value as compared to the crustose forms. The result suggests that lichen patches could be a potential tool for trapping airborne microbiota even in Polar region although more detailed study is needed. Pollen analysis of 3 bulk ice samples was also initiated, which depicts the occurrence of air borne pollen and spores in low profile. This indicates that a continental ice sheet would also incorporate palynodebris that would be transported by ice flow until released by ice melt during glacier retreat. Completed pollen analysis of a 1.0 m sediment profile (Long lake), which is dated back to 1500 yrs BP showing the sedimentation rate of 4.38 cm/100 yrs.

S.K. Bera

Project 11: Proxy climatic signals from Marine and Coastal sediments during Late Quaternary

Component 1: Dinoflagellate cysts from marine sediments as proxy indicators of palaeoenvironmental changes along the western shelf of India during Late Quaternary

Carried out photodocumentation and study of calcareous and organic-walled dinoflagellate cysts. Organic-walled dinocyst assemblage contains 20 species, with predominance of Protoperidinium group. Calcareous dinoflagellates are represented by 5 species: *Thoracosphaera heimii, Orthopithonella granifera, Sphaeroidinella albatrosiana, S. tuberosa* and *Calceodinellum* sp. Preliminary study of distribution patterns in respect to the oxygen minimum zone indicates that zooplanktic palynomorphs (Copepod egg envelopes and appendages, scolecodonts, Tintinnid loricae, foraminiferal lining) predominate over dinocysts within the OMZ.

Rahul Garg & Khowaja Ateequzzaman

Component 2: Algal evidence for Late Quaternary palaeoenvironment changes in the Bengal Basin

Consulted relevant literatures regarding the distribution of algae in coastal areas of West Bengal. Undertook a field trip to Digha and its adjoining areas, East Midnapur district to explore potential study sites and collected 4 soil profiles, one each from Digha (2 m), Ramnagar (1.30 m), Shankarpur (1.90 m) and Sarsanka (1.80 m). Besides, 6 samples were also collected for radiocarbon dating. For understanding the modern algal distribution pattern in this region, 70 surface soil samples as well as water samples from different depth and salinity level were collected. Chemical processing of 10 surface samples and part of the soil profile (6 samples) from Ramnagar area was carried out. The study of Ramnagar soil profile has revealed dominance of diatom taxa. The diatom assemblage is represented by various species of *Gramatophora*, *Synedra*, *Pinnularia*, etc. Surface sediment diatom assemblages in depth profiles along the Ramnagar Khal towards Mohana were analyzed to describe the relationship between species distribution and water depth of deposition. Morphotaxonomic study of the recovered diatoms is in progress.

Samir Sarkar

Component 3: Quaternary mangrove vegetation, environment, climate, ecology and sea level changes in south-east coast of India

Surveyed vegetation in coastal areas of Krishna River Delta and Kolleru Lake and collected sedimentary soil profiles for palynological study from freshly dug-out nine trenches in a cross-section from S-E to N-W of the lake. The lake extends to about 90 sq. km in between the Krishna and Godavari Delta. It is a palaeolagoon presently situated 35 km inland separated by the Kaikaluru sand barrier ridge. The Quaternary sediments surrounding the lake are marine. During the last deglaciation period excess fresh water from number of rivers (Tammileru, Budimeru, Gunderu, Rameleru) and other small streams inundated the entire vegetation to perish: the records of which are found in the form of large tree stumps buried under the sediment and finally resulted into the present Kolleru Lake. The lake is still connected to the Bay of Bengal through Upputeru River by which salt water enters into the lake during summer when the water level of the lake recedes to 0.6 m a.m.s.l. Otherwise the lake water rises up to 3 m a.m.s.l. during rainy seasons.

The sediments (depth 2.5 m) near Kaikalur (Kolleru Lake) dates back to 7490 ±110 yrs. BP and palynological study reveal the presence of mangroves and intertidal elements. Study indicates the beginning of Kaikalur sand ridge formation during this period. This phenomenon could be attributed to the Middle Holocene relative sea level rise and wet climate. High rate of sedimentation induced the formation of sand barrier Kaikalur ridge. The study suggests that the birth of Kolleru Lake took place around 1490 yrs BP. The red sediments were also collected from Visakhapatnam near Rishikonda. These are outcrops of loess red soil deposits and are massive highly homogeneous and show neither stratification nor laminations. Linear, branched calcrete formation is abundant. In Buminipatnam, Pleistocene red sediments occur overlying Precambrian khondalitic sediment gneisses. These beds separate the present shoreline area from eastern ghats.

Anjum Farooqui

Project 12: Palaeoethnobotanical investigations of Archaeological sites

Component 1: Palaeoethnobotany: Ancient man, plants and environment in north and north-western India- Studies of botanical remains from sites in UP and Rajasthan

In continuation to the work carried out on the botanical remains from the ancient site at Raja-Nal-Ka-Tila in Sonbhadra District, further investigations taken up, which added considerably to our understanding of the exploitation of botanical resources by ancient settlers at the site from 1800-700 B.C. In addition to the crops already reported, the remains of jowar-millet, black-gram, safflower, linseed and onion were new finds. Sole evidence of onion (*Allium cepa*) from this site has been reported for the first time in the archaeological context. Remains of a large number of weeds and other wild taxa encountered, have been identified as belonging to *Luffa acutangula, Fimbristylis tetragona, Leonotis nepetaefolia, Cyperus* sp., *Perilla frutescens, Gardenia* sp., *Celosia argentea, Oldenlendia* sp., *Amaranthus* sp., *Eleusine indica, Crataeva religiosa, Ziziphus* cf. *oenoplia, Murraya* cf. *konigii, Vitis trifolia, Corchorus* sp., *Polygonum plebeium, Polygonum* sp., *Argemone mexicana, Trianthema portulacastrum and Melilotus* cf. *indica*. Further, the seed and fruit remains of anwala, bahera, harra, cheraunji, grape/raisin (*Vitis vinifera*) and date (*Phoenix* sp), provided important information on their use for subsistence and medicinal purposes. Most important are a few seeds of American custard-apple/sharifa (*Annona* cf. *squamosa*) from the stratum dated to 740 B.C. This evidence in authenticity has led to postulate direct or indirect communication between India and South America, much early during pre-Columbian times.

Undertook a field-trip to an ancient site at Lahura Deva in Sant Kabirnagar, District (UP) where State Archaeology Department carried out a systematic excavation and collected a large amount of carbonised material from a wide range of cultural deposits at the site. On preliminary examination, the evidence of domesticated rice (*Oryza sativa*) in the beginning phase has amazingly pushed back the antiquity of rice cultivation to 6th-5th millenia B.C. (BS-1966: BP 6290 ±160, Cal. BC 5298; BS-1951: BP 5320 ±90, Cal. BC 4220, 4196, 4161). More collections would be made during the onward excavation on this early site.

Analysed carbonised remains from an indigenous Ahar cultural settlement at Ojiyana, District Bhilwara (Rajasthan). The ancient culture spanned from about 2500/2400 B.C. to 1500 B.C. A rich assemblage of about 14 species of cereals, millets, pulses and oil-seeds

is evocative of an advanced state of agriculture practised. The field-crops have included the remains of hulled-barley, naked-barley, bread-wheat, dwarf-wheat, rice, jowar-millet, field-pea, lentil, green-gram, horse-gram, grass-pea, chick-pea, til and linseed. Important is that the cultivation of rice spread up to Rajasthan during 2500/ 2400 B.C., from the early Ganga Valley cultures. Associated remains included a number of weeds and other wild taxa, indentifiable to *Vicia sativa*, *Coix lachryma*-jobi, *Ziziphus nummularia*, *Setaria* sp., *Echinochloa* cf. *crus-galli*, *Celosia* sp, *Bombax ceiba*, *Chenopodium album*, *Ipomoea* sp., *Rumex* cf. *dentatus*, *Trianthema triquetra*, *Scleria* sp., *Polygonum* sp., *Grewia* sp., etc. Further, identification of some remains is in process. Wood charcoals have been processed. Prepared a draft manuscript on the seed and fruit remains from Early Harappan Kunal (3000-2500 B.C.) district Hissar, Haryana.

K.S. Saraswat & A.K. Pokharia

A. Cultivated form (*Oriza sativa)*

B. Wild form (*Oriza rufipogon*)

Lahuradewa rice-remains from the early deposits dated to sixth-fifth millennia BC.

Component 2: Palaeoethnobotany: Ancient man, plants and environment in north and north-western India- Studies of botanical remains from ancient Pirvitani Sariff (UP)

Advanced state of agricultural economy observed during Painted Grey Ware to Kushana periods (ca. 800 B.C.-A.D. 300) by the detailed morphological investigations of 36 samples of seed and fruit remains collected from ancient site at Pirvitani Sariff, village Trilokpur, Sravasti district (UP) in Rapti valley near the foothills of Himalayas. In addition to a wide variety of field components reported earlier, new finds amongst pulses are of aconite bean (*Vigna aconitifolia*) and horse gram (*Dolichos biflorus*), both of Indian origin, oil-seed crop seasme (*Sesamum indicum*), locally available fruit of Phalsa (*Grewia asiatica*) from occupational phase of N.B.P.W., i.e. around 700/800 B.C.

New finds of weeds and other wild taxa discovered are crow-foot grass, *Carex* sp., spikerush-sedge, fimbristylis sedge, tick-clover/savivan, hairy indigo, blue alfalfa, sweet clover/safed senjhi, common-vetch, lalsabuni, morning glory, purslane, night-shade, piazi, day-fower faint, labbibi/khat-palak, sleepy catchfly and Hurhur. Day-flower faint (*Commelina benghalensis*), crow-foot grass (*Dactyloctenium aegyptium*), all the sedges, and lalsabuni (*Trianthema portulacastrum*) represent weeds in summer group crops like rice, whereas hairy indigo (*Indigofera hirsuta*), sweet-clover (*Melilotus alba*), piazi (*Asphodelus tenuifolius*) and common-vetch (*Vicia sativa*) are weed components in winter crops- wheat and barley. Sleepy catchfly (*Silene anthirrhina*) and night-shade (*Solanum* sp.) are also field weeds and tick-clover (*Desmodium gangeticum*) and labbibi (*Rumex dentatus*) represent moist and swampy localities in the surrounding of the habitational deposits. Amongst these finds morning glory (*Ipomoea* sp.), crow-foot grass and sweet clover are important as fodder, whereas blue-alfalfa (*Medicago* sp.) and Purslane (*Portulaca* sp.) are used as pot-herb (vegetable). Hurhur (*Cleome viscosa*), a weed is used as condiment. Prepared wood charcoal blocks (in 24 samples) for anatomical investigation from Chalcolithic site Charda, District Bahraich (UP).

Chanchala Srivastava

Project 13 : High resolution Climate variability based on Dendrochronological study

Component 1: Development of high-resolution proxy climate records for the western Himalaya

Crossdated 20 core samples of *Abies pindrow* collected from Chaurangikhal (Uttarkashi) using skeleton plot method. The age of samples extends back to around 1700 AD. The growth ring sequences of dated samples were measured. The tree ring-width series of individual samples were studied to understand the growth pattern. The inter tree growth variations are very high which could be due to the creation of inter tree gaps due to artificial or natural tree felling. The ring-width series are being studied to prepare the chronology for climate studies.

Studied the tree-growth climate relationship using the chronology of *Abies spectabilis* and mean temperature data of Shimla and Mukteswar. The study has shown that the May temperature has indirect relationship with tree growth. The tree-growth and temperature relationship has been found to vary in three sub-periods- 1897-1930, 1931-1960 and 1961-1990. The relationship was the strongest during 1897-1930. The climate data are being studied to understand such change in tree-growth and temperature relationship.

R.R. Yadav

Undertook field excursion to Himachal Pradesh and collected 5 sediment profiles from the alpine and temperate belts of Kullu and Mandi districts for pollen analysis. In addition, 32 surface samples were also collected from different floristic zones to study modern pollen/vegetation relationship. Completed pollen analysis of 5 surface samples from Naychhudwari, located in the alpine belt of Kullu District to study modern pollen deposition pattern in the region. The pollen data revealed the presence of alpine-scrubby vegetation of which grasses, sedges, *Artemisia*, *Potentilla*, Saxifragaceae, etc. are the major constituents of herbaceous complex. The scrubby elements, *Juniperus*, *Betula*, *Quercus*, *Rhododendron* and *Ephedra* are recovered in moderate to low frequencies. In general, the representation of all these taxa corresponds with their composition in the extant regional vegetation. The high frequencies of pollen of conifers viz., *Picea*, *Pinus* and *Cedrus* together with *Alnus*, *Corylus* and *Carpinus* denote their transportation by upthermic winds from the neighbouring temperate belt.

Pollen analysis of 4 samples from a 1.0 m deep sediment core from Naychhudwari Swamp has shown good representation of arboreals and non-arboreals. Among the non-arboreals, grasses followed by sedges Cheno/Am, *Artemisia*, *Potentilla*, Rosaceae and Saxifragaceae are the better represented in contrast to scrubby elements such as *Juniperus*, *Quercus*, *Betula* and *Salix*. The over all vegetation composition suggests the existence of alpine steppe in the region during the course of sediment deposition. The preponderance of pollen of *Pinus*, *Cedrus*, *Picea* and *Abies* denotes their transportation by winds from the temperate belt.

M.S. Chauhan

Component 2: Analysis of climatic changes based on multi-proxy data during last 1000 years from peninsular and Himalayan regions

Analysed tree growth climate relationship in teak (Tectona grandis) based on tree ring chronology of teak, which extends from 1836 to 1997 AD made from Hoshangabad District (MP). This analysis shows that temperature of August, November and December of prior year and current year's January and May have positive significant response, whereas precipitation during current October has positive relationship and May has negative role. Tree rings from 18 discs of teak collected from left over old stumps from Parambiculum Forest Division (Kerala) of which logging dates are not known have also been dated through cross dating with the core samples from living trees of this region. This chronology extends from 1629-1999 AD. Undertook a field trip around Kinnaur and adjoining region and collected tree ring samples from 289 trees. Besides, 14 surface sediments along with 3 sediment profiles were also collected for palynological analysis.

Amalava Bhattacharyya

Project 14: Special Activities

Component 1: Accretionary evolution, tectonics and palaeoclimate in Lahaul-Spiti, Ladakh and eastern Karakoram regions: Study based on Tectonics, Geochemistry, Sedimentology, Petrography, Magnetostratigraphy and palaeobotanical evidences

Undertook a field work in northern Ladakh (Nubra-Shyok Valley), eastern Ladakh (Pangong Tso, Chushul, Henley Transact), central Ladakh (Leh, Puga Valley) and western Ladakh (Bodhkharbu and Shergol) regions and collected samples and plant fossils from different sedimentary horizons. Carried out detail geological mapping of the Nubra-Shyok Valley and collected samples from a Quaternary section of fluvio-lacustrine origin exposed in the valley and various other sedimentary sections for magnetostratigraphic, environmental magnetism, palynological and geochemical investigations. Prepared lithologs and recorded 4 levels of palaeoseismic structures along with other sedimentological details. Identified seismically induced soft-sediment deformation structures (seismites) at various stratigraphic levels and collected samples for their datings (radiocarbon, TL/OSL) to possibly calculate the interval of recurrence of palaeo-earthquakes in the region. To establish an absolute chronology by isotopic dating of magmatic rocks and for Quaternary samples environmental magnetism technique will be used for palaeoclimate analysis in the Quaternary times.

To understand the weathering processes and elemental mobility several weathering profiles developed over different rock types have been collected. To ascertain the dominant mode of weathering and contribution of the major rock types water samples form first order streams and major rivers have also been collected. Water samples were taken to JNU, New Delhi and some parameters have been investigated. For rest of the investigations, analysis is in progress. Physical processing of hard rocks and sediment samples is also in progress.

Carried out random sampling in eastern Ladakh area to observe the continuation of different rock formations in the Pangong Tso, Chusul and Henley regions. The Spituk palaeolake section (30 m thick) in Leh of central Ladakh is also sampled for mineral magnetic parameters, geochemical studies and for C14 dating. Mineral magnetic analysis was carried out at the WIHG, Dehradun. Four magnetozones have been recognized which are being supplemented with other parameters (Clay Mineralogy and Palynology). Weathering profile developed over granites of Ladakh Batholith is sampled to understand the surface geological processes. Mega plant fossils are also collected from conglomeratic sequence of Hemis locality of Ladakh.

Collected rock samples for geochemical and palynological studies and some plant fragments from the Chiktan Nala Section and Nindam Formation of the Bodhkharbu-Shergol region (western Ladakh). Carried out palynological investigation on the sediments of the Shergol and Chiktan sections. The assemblage recovered from Shergol area comprises *Proxapertites microreticulatus, P. operculatus. Dracaenoipollis circularis, Spinizonocolpites echinatus, Retimonosulcites ellipticus, Liliacidites matanomadhensis* and *Matanomadhiasulcites* cf. *kutchensis*, indicating Palaeocene/Eocene age of the assemblage, with sporadic occurrence of *Schizaeoisporites* sp. and cf. *Microcachryidites*.sp. Besides, Late Permian and Mesozoic reworked palynofossils represented by *Striatites sewardii*, *Faunipollenites varius*, *Verticipollenites sectretus*, *Cuneatisporites radialis*, *Scheuringipollenites* sp. and *Densipollenites indicus* have also been recorded. In addition to the above-mentioned reworked palynomorphs, *Pinuspollenites crestus* and *Albiespollenites cognatus* have also been recovered which indicate Miocene age of the Chiktan Nala Section.

On the basis of *Spinizonocolpites* (*Nypa* pollen) it has been concluded that the sediments of the Shergol area were deposited in a tropical, estuarine-near coast, tropical warm and humid environment. The Chiktan Nala sediments, on the other hand, were deposited in a lacustrine enviroment due to occurrence of colonial algae, viz., *Pediastrum* and Pinnate diatom.

A.K. Sinha, Ram Awatar, Anupam Sharma, Rajeev Upadhyay & Binita Phartiyal

Component 2: Floral diversity, evolution, palaeoecological interpretation and relationship of Permian flora of eastern Himalaya

The floristic comparison and stratigraphical significance of the flora from Permian sediments indicate that the flora of Arunachal Pradesh and Sikkim are mainly represented by species of *Gangamopteris*, *Glossopteris* and *Noeggerathiopsis* and such association is comparable with Lower Barakar flora, whereas Darjeeling flora dominated by the species of *Glossopteris* and presence of equisetalean genera *Phyllotheca* and *Schizoneura* compare with the floras of Raniganj Formation of peninsular Gondwana basin. The vertically preserved *Vertebraria*-axes recorded from Kalijhore Nala Section of Darjeeling Coalfield and Rohtak Nala Section of South Sikkim District suggests probable in situ deposition of plant material. The palynological assemblages recovered from Permian exposures of Darjeeling are comparable with the mioflora of Raniganj Formation. The recovery of mioflora from Arunachal Pradesh is extremely poor and it is mostly represented by the presence of *Botryococcus* colony. Rohtak Nala Section (Sikkim) has found to contain the species of *Sahnites*, *Virkkipollenites*, *Striatites*, *Distriatites* and *Microbaculispora* comparable with the Lower Barakar flora of peninsular India.

Compiled the mega and mioflora assemblages recovered from different sections of Permian sequence of northeastern part to decipher the floral relationship with the known assemblages of peninsular Gondwana. The palaeoecological significance of vertically preserved *Vertebraria*-axes and *Botryococcus* algal colony are discussed. So far extra Gondwanic elements have not been recorded in Permian sequence of northeastern region.

A.K. Srivastava & A.P. Bhattacharyya

Component 3: Growth ring studies in fossil woods and their significance in palaeoclimate

Collected relevant data on growth rings of Maestrichtian-Danian (Deccan Trap) woods. Further work is in progress.

J.S. Guleria

Compiled Jurassic-Early Cretaceous wood taxa of India. Contributed to the global palaeogeographic implication of these wood taxa. Fossil woods of Jurassic (Kota Formation) of Pranhita-Godavari Graben were investigated and a new species of *Araucarioxylon* has been instituted.

A. Rajanikanth

Component 4: Floral diversity and ecology of Mahuadanr beds, Chachhari Valley, Palamu

Plant fossil from Mahuadanr beds already collected were sorted out and tentative identification has been made.

G.P. Srivastava

Component 5: Cryptic morphology of seeds/fruits of the flora of Karnataka (western Ghats) using SEM/TEM techniques and bearing on ecology

Studied anatomical details of the fruits of *Calophyllum innophyllum* and *Garcinia xanthochymus* (Clusiaceae) under LM and SEM. It was observed that pericarp in *Calophyllum innophyllum* is highly differentiated into distinct exocarp, mesocarp and endocarp layers. In *Garcinia xanthochymus*, the mesocarp is highly flashy and occupies major part of the fruit endocarp is papery. Fruit of *Labromia bojeri* and *Mimosops elengi* (Sapotaceae) show specific anatomical differences. In *L. bojeri* profuse late canals and patches of thick walled cells are present in mesocarp, while *M. elengi* specifically contains bundles of raphides. Further, anatomical studies of *Barringtonia recimosa* (Lecythidaceae), *Peltophorum pterocarpum* (Leguminosae), *Euphorbia hirta* (Euphorbiaceae) and *Caffia arabica* (Rubiaceae) are under progress.

Undertook a field work for collection of the seeds/ fruits from different places such as Mangalore, Hebri, Agumbe, etc. (Karnataka) and about 50 specimens representing seeds and fruits were collected. Consultation at the Central National Herbarium was also carried out for evaluation of the above collected material.

K. Ambwani & Usha Bajpai

Component 6: Aerobiology in relation to pollen production, dispersal and preservation of pollen grains

Collected more data (phenological, aerobiological and clinical) for "An atlas of air-borne pollen grains of Lucknow plants and their allergenic significance". Concentrated more on clinical data, procured from CSMMU and Balrampur Hospital in Lucknow, pertaining to Atopic and Nonatopic allergic patients, their clinical history, diagnostic tests and proper treatment. Collected polleniferous material of plant taxa such as *Albizzia lebbeck*, *Acacia aureculiformis*, *Allium cepa*, *Alternanthera sessilis*, *Ailanthus excelsa*, *Cannabis sativa*, *Cyperus rotundus*, *Ceiba pentandra*, *Eucalyptus citriodora*, *Morus alba*, *Moringa oleifera*, *Ricinus communis*, *Parthenium hysterophorus*, *Putranjiva roxburghii, Terminalia arjuna, Tamarindus indica* and *Xanthium strumarium* for studying pollen production per anther.

Prepared and finalized a paper entitled "Qualitative and quantitative assessment of aerobiopollutants in Chowk, Lucknow". Finalized two papers (jointly with S.K. Bera) entitled "Prevalence of pollen in the air and sediments in and around Dokriani Glacier, Garhwal Himalaya" and "Incidence of aerobiopollutants over southern Ocean and Schirmacher Oasis, East Antarctica".

Asha Khandelwal

Component 7: Floristic and ethnobotanical studies of Bastar (Chhattisgarh) and Shahdol (MP) districts and automation of herbarium using software

Surveyed southern part of Shahdol district (Pusprajgarh and Amarkantak areas, MP) and collected about 1200 plant specimens, 200 samples of seeds and fruits, 300 samples of polleniferous materials and 10 samples of wood blocks as reference material. Studied all the plant specimens and identified about 500 plant species belonging to 350 genera and 115 families. All the plant materials are processed and poisoned. Different tribal (Gond and Baiga) areas were surveyed to document various uses of plants for treatment of different diseases and use of plant in other requirements. Collected about 200 plant specimens used as medicine, 20 plant specimens used as food, 11 plant specimens used as fibre, 8 plant specimens used for extraction of medicinal and edible oil, and about 30 plant specimen used in preparation of brooms and baskets. About 40 museum samples of herbal medicines are also collected. Preserved all these samples in specimen bottles and displayed in Herbarium showcases.

Proper search and planning are being carried out to find and incorporate various data spread over in literature, into the database and a data card was designed to feed all possible informations about living and fossil plants. A plan for the structure of the database is prepared. Computer scanning of about 150 extant species and 80 related specimens of fossil and archaeobotanical samples were prepared.

D.C. Saini

Component 8: An isotope and geochronometry based approach to decipher palaeoclimate records in Indian lake sediments and its synthesis with pollen based information

Undertook a field trip to Loktak Lake (Manipur). After collecting geological and other information about the lake, a survey was done and collected 7 sediment samples from a trench of 85 cm depth, dug near the lake. This biggest fresh water lake of the northeast India has lineaments on two sides and has alluvium around it and of much interest. The organic carbon measurement was carried out on 2 samples by loss on ignition method and palynological analyses carried out on 6 of them. The radio carbon dating of 2 samples was tried and on 2

more is in progress. The Back Scattered X-ray elemental analyses of three samples have also been initiated. The results indicate changes in climatic conditions to drier during the deposition as evidenced in gradual decrease in the fungal spores as well as ferns. *Pinus* and *Alnus* dominate the later part of deposit among trees but the assemblage as a whole is dominated by open type vegetation. *Pinus*, *Alnus*, *Betula*, etc. are, however inferred to be result of transportation from the higher (subtropical and temperate) belt. The recent sediments evince presence of anthropogenic effects as well as some exotic weeds like *Xanthium* and *Lantana*.

C.M. Nautiyal & M.S. Chauhan

Component 9: Radiocarbon dating of deposits relating to Quaternary geological and archaeobotanical investigations and chemical analysis of sediments for palaeoenvironmental and palaeoclimatic studies

A total of 151 samples have been processed in the Radiocarbon Laboratory during this year. Apart from regular samples several backgrounds and an international standard (FIRI-H) were also run. The age of the FIRI-H obtained (less than one half life of C-14) was in good agreement with the consensus value (Boaretto et al. 2002). In order to improve the quality of sample processing a metallic vacuum chamber has been designed to store the lithium metal. Both the counters, the Quantulus and the Rackbeta are being used for counting purposes. The Rackbeta being a less sensitive instrument is used only for counting relatively modern samples.

The radiocarbon dates of Bet Dwarka samples provide very important clues in establishing the cultural sequence of the Island. The dates confirm the hypothesis based on archaeological remains that the Island was initially habituated around the beginning of the second millennium BC and habitation lasted for a couple of centuries. A wood sample from a megalithic burial tradition was dated to be 200 years old; this provided some information on the cultural tradition of the Angam Nagas.

A sediment sample from the Dhadas river basin, Mariland (Gujarat) was dated to be 8630 yr BP. This study helped in reconstructing the Late Quaternary tectonic history and landscape evolution in the area. Another sediment sample from the Purna Basin, Vidharbha was dated to 1160 yr BP. The date provided important information regarding the cultural correlation of the basin. Two peat samples were dated to be 4600 and 5290 yr old. These samples were collected from the Garhwal Himalaya and helped to reconstruct the climatic and monsoonal history in this region.

Supriya Chakraborty

Component 10: Stable isotope mass spectrometry laboratory for palaeoenvironmental studies

To establish a Mass Spectrometry Laboratory involves- procurement of an Isotope Ratio Mass Spectrometer (IRMS), and fabrication of a high vacuum glass system for sample processing. The list of equipments required for the sample processing laboratory have been prepared. The major items are: vacuum rotary pumps, diffusion pump, water chiller, water equilibration bath, muffle furnace, high pressure gas cylinder, vacuum gauges, glassware, chemicals, etc.

Supriya Chakraborty

Component 11: Establishment of Palaeobotanical-Geochemical laboratory

Revised proposal is drafted which includes clear vision, realistic manpower requirement, phase manner procurement of necessary equipment and space requirement along with the items list for physical and chemical processing units. The proposal is sent to Dy. Director General, GSI, Lucknow and Head, KDMIPE, Dehradun for their valuable advice.

Anupam Sharma

Component 12: National centre for Global Geosphere-Biosphere Change research

Revised and finalized the project proposal after interaction with the identified experts as per comments/ advice of the Research Advisory Council of the Institute for submission to DST for funding. Also prepared Vision 2020 perspective plan for Global climate change research and Forensic Palynology.

Chhaya Sharma

Contribution other than Project Work

The existing samples of Archaean age in BSIP museum have been studied on the advice of RAC. Also studied petrographic thin sections of the grey to grayish-black silicified dolomite belonging to Member 'A' of Kasia Formation, Iron Ore Supergroup exposed near Barbil (Orissa) for the organic-walled microfossils.

Rupendra Babu

Finalized the studies on the geology and palaeontology of Gondwana sequences of Ib-River Coalfield (Orissa) based on the plant fossils. The megafloral assemblage consists of 94 taxa representing 24 genera belonging to Lycophyta, Equisetales, Sphenophyllales, Filicales, Cordaitales, Cycadales, Ginkgoales, Coniferales and Glossopteridales. The order Glossopteridales is highly diversified with 63 species. The megaflora of the field is equally diversified as that of the adjacent Talcher Coalfield.

Shaila Chandra & K.J. Singh

The work on the Athgarh Formation of Mahanadi Basin was undertaken to compile the palaeoflora and an attempt has been made to date it precisely. The comprehensive study reveals that palaeoflora encompasses pteridophytes, cycadophytes (cycads and bennettitales) and conifers, where conifers and pteridophytes are dominant; cycadophytes are rare. The important macro- and microfossils are *Gleichenia, Hausmannia, Cycadopteris, Onychiopsis, Araucariacites and Callialasporites* pollen complex with significant number of *Murospora, Pxillitriletes* and *Lametatriletes indicus* (*in situ* spore of *Weicheselia*). The comparison and correlation with contemporary floral assemblages of other basins of India exhibit that the formation represents an Early Cretaceous sequence in the basin, which may be an eastern extension of Bansa flora of Jabalpur Formation.

Neeru Prakash

Carried out investigations on megaspores from Barakar Formation of Rawanwara Colliery, Pench Valley Coalfield (Satpura Gondwana Basin) and finalized the result. The assemblage comprises *Talchirella trivedii, Barakarella pantii, Bokarosporites rotundus, Duosporites multipunctatus, D. congoensis and Singhisporites radialis.* The distribution of megaspores is discussed in relation to their structural characters.

A.K. Srivastava & Rajni Tewari

Stomatal index analysis from fossil leaf cuticle has emerged as one of the most significant tools in estimating pCO_2 in recent years. It has been applied on the fossil leaf cuticle of *Terminalia catappa*, described recently from Upper Siwalik sediments of West Kameng District (Arunachal Pradesh) to determine the palaeoatmospheric carbon dioxide concentration of Upper Plio-Pleistocene age. On the basis of this study, it was found that pCO_2 concentration during this time was less than that of the present value.

Studied cuticular fragments assignable to five new species of the genus *Lusaticutis* Roselt and Schneider, viz., *L. makumensis*, *L. assamensis*, *L. dilcherii*, *L. barailensis* and *L. lakhanpalii*, from Tikak Parbat Formation (Oligocene) of Makum Coalfield (Assam). These are differentiated on the basis of their distinct structural features. The cuticles reveal both mesomorphic and xeromorphic features.

R.C. Mehrotra & Rajni Tewari

Finalized palynological study of additional samples from Karakoram area. Processed samples from Ladakh area, and from Bir Bhatti area (Kumaon Himalaya) for recovery of palynomorphs.

Neerja Jha

Studied in detail a unique organic remains- *Orissiella* gen. nov. recovered from palynological preparations from Upper Permian coal-bearing horizons of Talcher Coalfield. These organic bodies show morphological similarity with the coelenterates.

Archana Tripathi

The palynological investigations have been done for the dating of about 281 m thick strata from borehole SSM-2 in Mahuli-Mahersop area, Singrauli Coalfield. Initial studies indicate Triassic age for the sequence. Detailed work is continued for the precise dating of the strata. Visited Geological Survey of India, Kolkata to discuss the palynological reports with the concern officers of Coal Wing. A field excursion to Rajmahal Basin was undertaken and material was collected from four drill-cores. A survey around Deocha was made to explore the probability of outcrop sections.

Grebespora concentrica

Lundbladispora reticulata

Archana Tripathi & Vijaya

Revised and updated the draft of "A Catalogue of Indian Tertiary Plants (Megafossils) 1989-2001".

J.S. Guleria & Rashmi Srivastava

Finalized palynological studies on rock samples from Chandi Devi Road Section and Mansadevi Road Section of Middle Siwalik sequences exposed near Hardwar (Uttaranchal). The assemblage is dominated by gymnospermic bisaccate pollen assigned to *Abiespollenites* spp., *Pinuspollenites* spp. and *Podocarpidites* spp. Subdominant elements in the assemblage are the pteridophytic spores represented by different species of *Lygodiumsporites, Schizaeoisporites, Striatriletes, Polypodiaceaesporites, and Monolites*. Angiosperms are represented by pollen grains assigned to different species of *Pinjoriapollis*, *Palmaepollenites*, *Retitrescolpites*, *Sapotaceoidaepollenites*, *Ctenolophonidites*, *Malvacearumpollis*, *Liguliforaedites* and *Graminidites*. Similarity between the present assemblage and that from upper part of Middle Siwalik succession of Bagh Rao (Uttaranchal) was noticed as in both of these high incidences of pteridophytic spores (*Lycopodiumsporites*, *Striatriletes*) and gymnosperm pollen are recorded. The assemblage from Palynological Zone A of subsurface sequence in Ramshar Well (HP) is comparable to the present assemblage because of common occurrence of some palynotaxa.

R.K. Saxena & S.K.M. Tripathi

A catalogue, including all recorded spores and pollen from the Indian Tertiary sediments published after 1988 up to 2002, has been prepared and is being finalized. This will update the earlier catalogue on Indian Tertiary spores and pollen (Saxena 1991).

R.K. Saxena & G.K. Trivedi

Recovered a palynofloral assemblage from the Boldamgiri Formation exposed near Adugiri along the Tura-Dalu road, West Garo Hills (Meghalaya). The recovered palynoflora consists of dinoflagellate cysts, fungal spores and ascostromata, pteridophytic spores, gymnospermous and angiospermous pollen. Two distinct palynozones have been recognized on the abundance and distribution of stratigraphically significant palynofossils in the succession. Palynological data suggests that the Boldamgiri Formation was mostly laid down in coastal marine environment. The palynoflora has been compared with the Miocene assemblages recorded from various sedimentary basins of India and abroad and has been assigned Early Miocene age for the Boldamgiri Formation.

Samir Sarkar & R.K. Saxena

Carried out study on fossil leaf of *Phyllanthus mampuiensis* sp. nov. from Early Miocene of Mizoram.

Anil Agarwal & B.D. Mandaokar

Studied two leaf impressions having cuticles from Profile 6 of Middle Siwalik sequence of Arjun Khola (Nepal). On the basis of available morphological as well as cuticular characters, these leaf impressions have been identified with extant taxa *Sterculia coccinea* Jack of the family Sterculiaceae and *Diospyrous toposia* Ham. of Ebenaceae. The present day distribution of the modern equivalent taxa of the fossils and the presence of fungal spore in the cuticle of the fossil collectively indicate the prevalence of warm humid climate in the area during sedimentation.

M. Prasad & E. G. Khare

Studied the palynoflora of Tertiary sediments, which represents between 295 m to 40 m depth level of a 566.60 m thick PGD-1A borehole, from Panagarh sub-basin (Damodar Basin). The assemblage is dominated by spores (*Striatriletes*), whereas conifer pollen are rare. The frequency of taxa, *viz., Striatriletes, Warkallipollenites, Malvacearumpollis, Lanagiopollis, Paleomalvaceaepollis, Echitriporites, Cheilanthoidspora*, etc. in the assemblage indicate the late Oligocene-early Miocene age of the sediment. Dinoflagellate cysts, microforaminifera tests and mangrove elements reflect marine influence up to the basin margin at that time. High frequency of *Striatriletes* (*Ceratopteris*) reflects marginal deltaic deposition.

J.P. Mandal & Vijaya

Recovered nannofossils of late Triassic age from Lamayuru Complex of Indus Suture Zone (Ladakh Himalaya). The fine-grained, thinly bedded, grey to dirty yellow coloured shale has also yielded Triassic age marker bivalve *Daonella indica*. The recorded nannofossil species are *Archaeozygodiscus koessensis*, *Crucirhabdus minutus*, *Hayococcus floralis*, *Tetralithus cassianus*, *Orthopithonella geometrica* and a variety of calcispheres, broken tests of calcareous dinoflagellates and few unidentified forms. The assemblage indicates Norian/Rhaetian age and is equivalent to NT2 *Prinsiosphaera triassica* zone of Brawler et al. (1991).

Jyotsana Rai

Finalized three manuscripts entitled "*Callosphaeridium scabratum* sp. nov.- a new dinoflagellate cyst species from the Early Turonian of Cauvery Basin, India", "Re-interpretation of archaeopyle type in Leberidocysta? scabrata (Jain & Tougardeau-Lantz) Stover & Evitt 1978", and "Dinoflagellate cyst evidence on the age of Kullakalnattam Sandstone Member, Garudamangalam Formation, Cauvery Basin, southern India".

Rahul Garg & Khowaja-Ateequzzaman

Finalised a manuscript on dispersed organic matter from the Neogene and Pleistocene sediments of Site 218 of Leg 22, Bengal Fan, Indian Ocean.

Anil Chandra, R.K. Saxena & Madhav Kumar

The project "Lake sediment pollen analytical studies in Rajasthan to reconstruct the vegetational history and climatic changes since Last Glacial Maximum (LGM)" was initiated from August 2002. Undertook a field trip to Rajasthan to survey and collect research materials from seven different sites. Analysis of 8 samples from Keoladeo National Park- the world known Bird Sanctuary at Bharatpur - have revealed rich pollen and spore assemblage. Important recovered taxa are members of Poaceae, Cyperaceae, Urticaceae, Asteraceae (Tubuliflorae), Polygonaceae, *Typha*, and Oleaceae along with algal filaments, fungal hyphae, bryophytic spores, etc. Studies are likely to decipher the commencement of wetland conditions in the area, which at present is a shallow water large expanse.

Chhaya Sharma & Navita Budhraja

Initiated chemical processing of 4 samples received from Spituk palaeolake, Ladakh.

A.K. Sinha, Chhaya Sharma, Binita Phartiyal & Anjali Trivedi

Prepared draft of an article dealing with significance of fungal remains for the studies on biodeterioration of cultural properties.

Asha Gupta

Revised the manuscript entitled 'Early Holocene pollen data from Mikir Hills, Assam' as per suggestions. Prepared another paper entitled 'Modern pollen spectra in and around Dilli-Jeypore Colliery, Assam'.

S.K. Bera

Palynostratigraphical study of a sedimentary profile collected from Mansarovar Lake, Talbahat (Lalitpur, UP) reveals the history of vegetation since 3720 ±30 yrs BP. The emergence of arboreals was recorded only since 2500 yrs BP reaching its climax around 1420 ± 130 yrs BP. The plant species that existed in the past show resemblance with the present vegetation in the reserve forest area around the lake. However, meagre pollen record in the sediment deposited since the last millennium suggests the reduction in the forest cover. Reasons could be attributed to anthropogenic pressure with the development of Talbahat town and National Highway intersecting the lake. Climatic factors and explotation of lake water in recent years have reduced the lake boundary.

Anjum Farooqui

Finalized two papers entitled "Weathering of amphibolites at two different climatic regimes in the upper reaches of Cauvery River Basin, south India" and "Weathering of granites and elemental speciation under semi-arid sub-tropical climate at Magdi, Karnataka" with Prof. V. Rajamani.

Anupam Sharma

Finalized two papers entitled "A Geomagnetic Excursion/Event at ~20,000-19,000 Yrs BP recorded from the palaeolake sediments of Pithoragarh and Champawat districts, (Kumaun Lesser Himalaya) Uttaranchal, India" and "Late Quaternary environments in the Kumaun Lesser Himalayas, India- Deduced from multi-disciplinary techniques".

Binita Phartiyal

A wide range of cuticular ornamentation and structural variation is exhibited by the various species of Cycas under TEM and SEM. it was found that the ornamentation varies little within individual species and has been shown to be under strong genetic control, less influenced by local microclimatic variation.

Usha Bajpai

Finalized a research proposal entitled Reconstruction of the atmospheric radiocarbon activities using teak tree for the last 350 years over peninsular India and submitted to DST.

S. Chakraborty & A. Bhattacharyya

Collaborative Work

Studied both petrographic thin section and isolated residues by using standard maceration techniques of surface samples of silicified black carbonaceous shale associated with black chert nodules of Infra Krol Formation, Baliana Group. These nodules contain diversified 21 genera of organic-walled microfossils (OWM) comprising cyanobacterial remains and planktic acritarchs belonging to sphaeromorphida and sphaerohystrichomorphida groups. Out of these, 6 genera are additional of acritarch belonging as well as 4 genera of the cyanobacterial remains belongs to family chroococcaceae and oscillatoriaceae, besides single genera of VSM, viz. *Melanocyrillium hexodiadema* is also being recorded. The present microbiotic assemblage is well known from the Terminal Neoproterozoic sediments. However large sized acanthomorph *Trachyhystrichosphaera vidalii* is being recorded here for the first time that is known globally after Varanger glaciation and before diversification of Ediacaran biota. Critical analyses of microbiotic assemblage suggests that this sequence was autochthonous in nature and an indicative of moderate deeper water open shelf condition for the sediments of Infra Krol Formation exposed around Nainital (Uttaranchal).

Manoj Shukla & Rupendra Babu [& V.K. Mathur & D.K. Srivastava (GSI, Northern Region, Lucknow)]

Completed a comparative study of Precambrian microfossils under DST sponsored ILTP collaboration in Science and Technology between BSIP and Russian Academy of Sciences. Mesoproterozoic silicified microbiotas are analysed for their characteristics and contrasts. 8 silicified Mesoproterozoic microbiotas of peritidal and shallow subtidal setting from Siberia, Ural and India have been analysed. These microbiotas are subdivided into three main types - Kotuikan, Satka and Kataskin - that are characterized by different taxonomic composition of microfossils. Mat-building entophysalidacean algae (*Eoentophysalis*), ellipsoidal akinetes of Nostocalean cyanobacteria genus Archaeoellipsoides and spherical large planktic microfossils *Myxococcoides grandis* of uncertain affinities dominate the Kotuikan type microbiotas, whereas the short trichomes are rare, but a distinctive element of these assemblages. The Satka type microbiotas are dominated by mat-building hormogonian cyanobacteria of genus *Siphonophycus* and Chroococcacean dwellers genera *Gloeodiniopsis*, *Eosynechococcus*, *Sphaerophycus*, but entophysalidacean cyanobacteria are missing and akinetes of genus *Archaeoellipsoides* occur, but never abundant.

In another comparative study, an effort has been made to understand the genesis of carbonate precipitate patterns and associated microfossils in Mesoproterozoic formations of India (cherts of Vindhyan Supergroup) and Russia (Siberian chert). In Vindhyan sediments the precipitates were deposited inorganically without active participation of cyanobacterial mats in their formation and can be separated into 3 distinctive morphological categories- radial-fibrous fans; microlaminated stratiform laminae, and poorly differentiated laminated stratiform laminae. The diverse assemblage of cyanobacteria is preserved either inside precipitate, where they have excellent preservation, or in other syn-sedimentary textures. The precipitates and microfossil assemblages from 4 Mesoproterozoic formations of the Siberia are also described and compared with the Jaradag Limestone of India. The comparison of the precipitates and associated microfossil assemblages reveals that the pattern holds good for almost all contemporaneous carbonate precipitates and microbiotas in cherts and analyzed in details.

For further studies, a field work was undertaken in the Krol Belt of Himachal Himalaya. Preliminary investigations have revealed occurrence of a large number of mats and smooth walled acritarchs in the nodular cherts of the Infra-Krol Formation.

Mukund Sharma [& V.N. Sergeev (Geological Institute, Russian Academy of Sciences, Moscow)]

Finalized the work on the conifer genus *Buriadia*.

Shaila Chandra & K.J. Singh [& Gar Rothwell & Gene Mapes (Ohio State Univ., USA)]

Pollen grains of *Malva sylvestris* and *Hibiscus syriacus* were partially degraded with 2-aminoethanol for the duration of 1 to 24 hour(s) and were observed under SEM. Differences in degree of alterations in sculpture, ectexine and foot layer with respect to resistance and

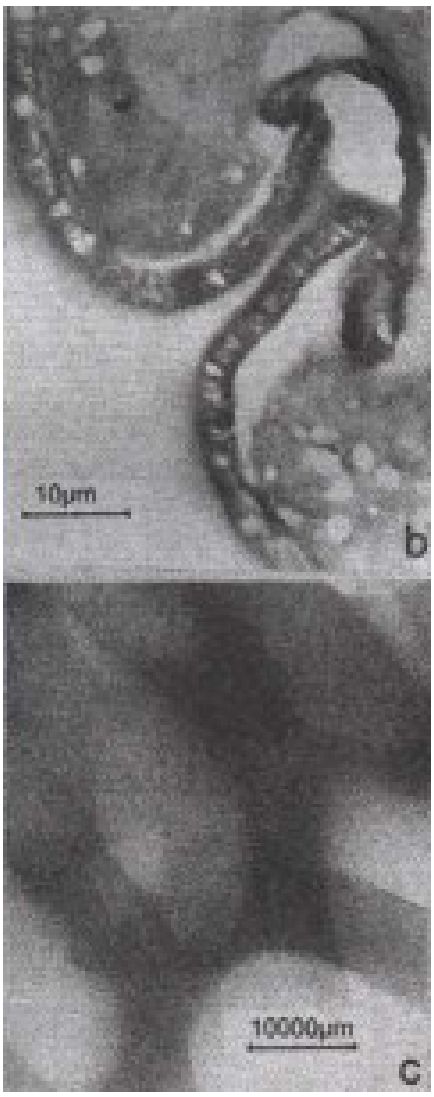
susceptibility to degradation were investigated and results were finalized.

Pollen grains of *Cycas rumphii* were treated with C60 fullerene/benzol solution and merkaptoethanol for 24 hours each. After washing, pollen were studied under TEM. Based on these studies it was concluded that biopolymer systems of different organization levels may be revealed in some taxa and good contrast in structures of exine could be achieved without using OsO_4.

S.K.M. Tripathi & Madhav Kumar [& M. Kedves (Hungary)]

International project Palaeobotanical study on the fossil woods from Java Island, Indonesia- The material for identification has been provided by Japanese counterparts. Preliminary observations have been done on 17 woods from Tenjo. Out of them 15 woods belong to Dipterocarpaceae and one to Combretaceae. Started preparing sections of fossil woods from Sepang, Java, Indonesia. Few woods are tentatively identified as *Terminalia* (Combretaceae) and *Dryobalanops* (Dipterocarpaceae). Further work is in progress.

Rashmi Srivastava [& Noriko Kagemori & Kazuo Terada (Japan) & Yance Mandang & Sapri Hadiwisastra (Indonesia)]



TEM. of ectexinous biomacromolecules

A paper describing two fossil woods from the Tertiary of northwestern India was finalized.

J.S. Guleria & Rashmi Srivastava [& A.C. Nanda & R.K. Sehgal (WIHG, Dehradun)]

Prepared a report based on identification of a wood sample of a ship excavated from Thaikkal, Alappuzha District (Kerala).

J.S. Guleria & B. Sekar [& M.V. Nair (SIAAHCM, Ernakulum, Kerala)]

Studied a petrified wood of Gluta from Lal Mai Hills, Comilla District, Bangladesh.

Anil Agarwal, K. Ambwani, R.K. Kar [& S. K. Saha]

Studied a fossil wood rotters (Polyporales) from the Lameta Formatiom (Maastrichtian) of India.

Anil Agarwal, R. Kar, R.K. Kar [& N. Sharma]

A fossil wood from the Pleistocene sediments of Kameng District, Arunachal Pradesh, was studied in detail and a manuscript on the same was finalized.

R.C. Mehrotra [& Ashutosh Joshi (GSI)]

The morphotaxonomical study of some leaf impressions collected from Lower Siwalik near Jarva in Balrampur District (UP) reveals some new fossil taxa,. They are comparable to 6 species like *Melodorum bicolor*, *Miliusa velutina* and *Polyalthia sumatrana* of the family Anonaceae, *Berchemia floribunda* of Rhamnaceae, *Millettia pubinervis* of Fabaceae and Ficus mysorensis of the Moraceae. On the basis of available data an attempt has been made to deduce the palaeoclimate and phytogeography of the area during sedimentation.

M. Prasad [& P.P. Tripathi & S.M. Pandey (M.L.K. P.G. College, Balrampur)]

Isotopic study on the Palaeosol as well as organic matter collected from Siwalik sequence of Surai Khola area has been carried out. Studied the oxygen isotopic composition of the calcite cement to understand the evolution of ground water and infer about the palaeo-precipitation. The 18O(PDB) value of sandstone cement ranges from -17 to -7‰. Up to about 8 Ma the oxygen isotope ratio shows depleted values with large scatter (-17 to -12‰). After 6 Ma d18O shows continuous enrichment till 4 Ma and then it shows a constant value of about -7‰. Depleted and scattered oxygen isotope value in the lower level may be partly due to high temperature diagenesis. The enrichment in d18O value probably indicates a change in isotopic composition of ground water caused by increased monsoon precipitation, which reduced the glacier melt water contribution in ground water. This inference about precipitation is corroborated by lithological changes, which suggest dominance of flood plains at this time indicating strong monsoon climate causing frequent high seasonal discharge.

M. Prasad [& S. K. Bhattacharya & P. Sanyal (PRL, Ahmedabad)]

Finalised work on the early Oligocene non-geniculate coralline algal assemblage from Al Bayda Formation of NE Libya. For the first time a rich assemblage of non-geniculate coralline algae has been recovered from the Algal Limestone Member of Al Bayda Formation. The algal assemblage is represented by species of *Sporolithon*, *Neogoniolithon* and *Lithothamnion*. Some forms have been tentatively assigned to the genera *Mesophyllum* and *Lithophyllum*. At places some genera of coralline algae, viz. *Sporolithon* and cf. *Lithophyllum* form rhodolith structures and their branches accumulate thick sediments. Palaeoenvironmental significance has been interpreted based on the coralline algal assemblage and associated faunal remains.

A.K. Ghosh [& Hassan S. Hassan (University of Garyounis, Libya)]

Finalised a manuscript entitled "A Siwalik palynoflora (Late Miocene) from the Rehar area of Nepal and its palaeoecological significance"

Samir Sarkar (& G.Corvinus (Nepal Research Center, Kathmandu, Nepal)]

Study of quantitative abundance fluctuations of siliceous microfossil groups and selected diatom species in the Late Neogene deposits from Neill and Havelock Islands and biostratigraphic study of Late Neogene deposits from Neill and Havelock Islands through diatoms and silicoflagellates.

Anil Chandra [with BGR (Germany)]

International project Holocene evolution of Chilika Lake, anthropogenic impact and pollution problems-Chilika Lake (Orissa), the largest brackish water lagoon of Asia is showing alarming environmental degradation. Hence, this lake is now on international focus and has been chosen as nodal area so as to generate data on Geochemical, dating, Molluscs and Ostracods studies (in Germany), Diatom studies (in Poland), and Palynological investigation (in BSIP) so that a complete understanding about the lake is reached. Prof. Burkhard Scharf and M. Gartner of Germany have done the coring (52) and collection of surface samples in association with Prof. M. Mohanti of India. The deepest core CH1 9 (7.80 m) from the lake was selected for palynological investigations (10 samples). It was procured at water depth of 1.5 m at 30.1ºC temperatures, and comprised of mainly light to dark grey silt.

The investigated samples exhibited good assemblage of palynodebris (pollen grains, fungal spores, fern spores, algal remains, dinoflagellate cysts, microforaminifera, etc.). Rhizophoraceae, *Sonneratia*, *Avicennia*, *Excoecina*, *Heritiera*, *Acanthus*, *Acrostichium*, *Lumnitzera*, etc represented the core mangrove taxa. Peripheral mangroves included *Barringtonia*, *Pandanus*, *Coccus*, *Borassus*, *Phoenix*, Fabaceae, *Terminalia*, Meliaceae, etc. The midland taxa comprised of *Anacardium*, Sapotaceae, *Emblica officinalis*, Myrtaceae, *Holoptelea integrifolia*, *Casuarina*, Malvaceae, Oleaceae, Brassicaceae, etc. The Ubiquitous taxa included *Artemesia*, Asteraceae, Poaceae, Urticaceae, Cyperaceae, Chenopodiaceae/ Amaranthaceae, Liliaceae, etc. The fresh water taxa included *Typha, Lemna, Nymphea, Potamogeton*, etc. Trilete and monolete spores, winged pollen, dinoflagellate cysts and microforaminifera were found in varying frequencies. The other aspects related with the profile were water content, which varied from 10% to 90%; organic matter 1% to 13% and Carbonates 1% to 6%. Since CH1 9 profile is exhibiting well-demarcated shift in vegetation with change in deposition environment, a few more intervening samples are to be pollen analyzed for fine resolution palynostratigraphical details.

Asha Khandelwal [& Burkhard Scharf (UFZ Centre for Environment Research, Germany)]

Undertook short field trips to Sanai Tal (Rai Bareli), Basaha Jheel (Unnao) and Misa Tal (Lucknow) and collected surface samples as well as living plants. Prepared and finalized two papers on Sanai Tal based on multi-proxy data. Completed the palynological investigations on Basaha Jheel, constructed the pollen diagram and finalized the work. Completed pollen analysis of a 2.3 m deep trench profile from Misa Tal and constructed the pollen diagram. The Misa pollen data have depicted open type of vegetation, mainly composed of grasses, sedges, Cheno/Am, Asteraceae, Malvaceae along with stray trees of Sapotaceae, *Acacia, Holoptelea, Syzygium* and Meliaceae since last 8000 yrs. The record of aquatic elements (*Nymphoides, Lemna, Myriophyllum, Potamogeton*) indicates the existence of lake in the early part of the sequence. The area was under the impact of anthropogenic activities as indicated by the encounter of *Cerealia* and other culture pollen taxa (Urticaceae, Caryophyllaceae, Brassicaceae, etc.). The recovery of pollen of *Pinus*, *Cedrus* and *Alnus* imply their transportation from Himalayan region mainly through watercourses.

Chhaya Sharma & M.S. Chauhan [& I.B. Singh (Lucknow)]

Undertook field trip to Chando Tal (Basti) and Bakhira Tal (Kabirnagar) and collected sedimentary profiles- one each from the lake sites. Started pollen analysis of profile from Bakhira Tal. Chemical processing of the profile materials is in progress. Investigated few samples have revealed good pollen assemblage.

Chhaya Sharma [& P.N. Shah (NRSA, Lucknow)]

Initiated chemical processing of a profile from Burfu alpine lake, Milam and completed four of them.

Chhaya Sharma [& B.S. Kotlia (Kumaun University, Nainital)]

Pollen analysis of the lichens/moss cushions collected from East Antarctica is continued.

Chhaya Sharma [& D.K. Upreti (NBRI, Lucknow)]

Finalized a paper entitled "Pollen study of Holocene sediments from Lake Priyadarshini-2, Eastern Antartica".

Chhaya Sharma & M.S. Chauhan [& Rajiv Sinha (IIT, Kanpur)]

Palynological investigations of 166 samples from 21 m deep core from Sambhar salt lake, Jaipur (Rajasthan) are in progress.

Chhaya Sharma & Navita Budhraja [& Rajiv Sinha (IIT, Kanpur)]

Revised the paper entitled "Signatures of climatic changes during last 5000 years in the Nizampatnam bay sediments".

Chhaya Sharma [& P.C. Srivastava (GSI, Lucknow)]

Visited Agra in December on the invitation to discuss about the palynological investigations to be undertaken from Mughal Gardens at Taj to decipher/reconstruct the past geological/archaeological/floristic history of the site. The detailed project is being finalized

Chhaya Sharma [& Tara Sharma (IHCL, Agra)]

A large number of sub surface sediments collected from Garbyang Quaternary section (300 5' 30"N : 800 50' 20"E) has been analyzed for pollen. These glacio-lacustrine sediments are found pollen productive. Detailed pollen counting is in progress.

A. Bhattacharyya [& B.S. Kotlia (Nainital)]

Palynological analysis from 12 m deep profile of lacustrine sub-surface sample of Kinnaur has been completed.

A. Bhattacharyya [& R.K. Ganjoo (Jammu)]

Cuticular structures of the two species of Murraya, *viz. M. paniculata* (L) Jack and *M. koenigii* (L) Spreng, were studied and compared using LM and SEM in order to identify these species on the basis of their epidermal features alone. A key has been provided for the identification of these two species.

Usha Bajpai [& C.L. Verma (Lucknow University)]

Sponsored Projects

Project- High altitude plant species response to global climate change. (Sponsored by G.B. Pant Institute of Himalayan Environment and Development Kosi-Katarmal, Almora, Department of Environment, New Delhi, No. GBPI/IERP/98-99/02/567)

Finalized the interpretation of palynological data along with tree ring data for the completion of the project and submitted the final report.

R.R. Yadav, S.K. Bera & Jayendra Singh

Project- Analysis of Climatic changes and glacial fluctuations using pollen and tree-ring data, in Gangotri Glacial area, Garhwal Himalayas. (Sponsored by DST, New Delhi, No. ES/91/018/97)

Interpretation of data towards climatic reconstruction during post-glacial period around Gangotri Glacier based on analyses of multi proxy data, viz. pollen, tree ring, isotope (13C), etc. is in progress.

A. Bhattacharyya & P.S. Ranhotra [& I.B. Singh (Lucknow) & N. Basvaiah (Mumbai)]

Project- Analysis of climate changes in Eastern Himalayan region using tree ring data. (Sponsored by DST, New Delhi, No. ESS/44/01/98)

Tree cores of *Pinus wallichiana* collected from in around Zero valley, Arunachal Pradesh have been dated. Relationships of tree growth/climate and impact of seismic events on the tree growth of this region has been made.

A. Bhattacharyya, Vandana Chaudhary & S.K. Shah

Project- Cretaceous megafloral and coprolitic-derived plant assemblage from the Deccan Trap associated sedimentary sequences in the Dongargaon, Pisdura area Maharashtra. (Sponsored by DST, New Delhi, No. ESS/23/VES/114/ 2000 dated July 05,2001)

Coprolite samples collected from Pisdura (20º. 22: 79º 04) a well known Cretaceous dinosaurian locality near Warora, Chandrapur District (Maharashtra) were subjected to maceration and fragmentary plant tissues such as cuticles, spores-pollen, woody parts as well as insect parts were recovered. *Aulacosira*, a fresh water diatom was reported for the first time from these coprolites. These diatoms are found as single cell structures sometimes filaments up to 5 cells are also recovered. Presence of these diatoms indicates that they were infested by the dinosaurs along with the water and were excreted as indigestible particles along with other faecal matters. Further, occurrence of fungi and scrab bettles were thrived before the faecal matter dried and probably voided on the land and fossilised later. Gymnospermous pollen, *Araucariacites australiensis, Azolla cretacea, Gabonisporites vigourouxii and Ariadnaesporites* sp., indicate that the coprolite belong to Maastrichtian in age.

EDAX of the coprolites was carried out and it was found that calcium and phosphorus are present in higher percentage. Carbon is also represented while the percentage of magnesium, sodium, silica, aluminium and iron, was meagre. It was assessed that presence of calcium and phosphorus in the coprolite is due to the phosphatization of the part of original organic matter in the sediments of Lameta Formation.

K. Ambwani, Rashmi Srivastava & Debi Dutta [& R.K. Kar]

Project- Tree-line dynamics in highland Himalayas, Himachal Pradesh (Sponsored by DST, New Delhi, No. 65/SERC/99 dated 15/3/99)

Collected 50 core samples from 35 trees of *Abies spectabilis* and 24 cores from 17 trees of *Pinus wallichiana* from Parbati Valley in Kullu (HP). The colonization pattern of young saplings of high-level fir and Himalayan pine were recorded at three high-altitude sites in the valley. The ring-widths of dated samples of fir and pine have been measured to prepare the chronology and tree growth/climate relationship.

R.R. Yadav & Bhasha Dubey

Project- Palynological, biopetrological and dispersed organic matter (DOM) study of Deccan Intertrappean sediments with reference to Cretaceous-Tertiary (K-T) transition. (Sponsored by DST No. SR/FTP/ES-51/2000)

Finalized palynological studies on the intertrappean beds exposed about 2 km. NE of Naskal village, Andhra Pradesh, representing the southeastern fringe of the Deccan basalt province. The studied section attains a

thickness of about 1 m and comprises carbonaceous shale, brown mudstone, chert, massive white mudstone and cross-bedded mudstone. The carbonaceous shale has yielded palynofossils, which though quantitatively poor, contain certain Maastrichtian marker forms. The palynofloral assemblage includes *Mulleripollis bolpurensis, Gabonisporites vigourouxii, Aquillapollenites indicus, Ariadaesporites* sp., *Azolla cretacea, Matanomadhiasulcites, Tricolporites reticulatus, Cyathidites australis, Liliacidites* sp., *Phragmothyrites* sp., dinoflagellate cysts and diatom cysts. Recovery of dinoflagellate cysts indicates that the depositional environment was influenced by brackish water conditions. Warm and humid climate is deduced by the presence of fungal spores and fruiting bodies and some pteridophytic spores during the deposition of the sediments.

Studies on the Deccan Intertrappean sediments are continuing and collections were made around Shahpura, Ranipur and Padwar areas (in MP). Palynological analysis of 3 boreholes drilled by D.G.M., Maharashtra in Umrer and Wardha coalfields has been initiated. The intertrappean beds were encountered when the boreholes were drilled through the Deccan Traps into the underlying Gondwana sediments during the prospecting of coal reserves.

Ratan Kar

Project- Long-term climate change in the western Himalaya using high-resolution tree-ring data (Sponsored by DST, New Delhi, No. ES/48/ICRP/005/ 2001 dated March 23, 2002)

Collected tree-ring samples of *Abies pindrow* (125 core samples from 47 trees) and *Cedrus deodara* (124 core samples from 44 trees) from different forest stands. The tree core samples are being crossdated using skeleton plot method. Some tree samples of *Cedrus deodara* are expected to be more than 600 years age. The data will help in augmenting the tree-ring data network for the western Himalaya for climate studies.

R.R. Yadav, Jayendra Singh & Rajesh Chaturvedi

Project- Studies of dust mites in the houses of asthmatic patients in Lucknow city and adjoining areas (CST, UP No. CST/SERPD/D-3415/2002).

It is aimed to work out the aerobiological, epidemiological and clinical features of bioallergens in general and house dust mites (HDM) in particular. The generated data would help to locate the source, assessment, qualitative and quantitative estimation, seasonal variations, and effect of meteorological variables on the incidence of mites in the house dust and its relevance to clinical data of asthmatic patients. The case histories of asthmatic patients with their residential address were procured. Visited patient's houses in different areas of Lucknow city, and the project- based questionnaire were filled- in to generate epidemiological data.

Collected 20 samples and processed through different techniques in order to procure the maximum quantity and types of HDM. Out of which, sample nos. 2, 4 and 5 had high frequency of house dust mites, no. 3 had moderate, nos. 9, 10, 13 and 14 had rare, while rest were devoid of HDM. The total absence of HDM may be attributed to very low temperature records in winter period. Fungal spores- *Alternaria*, *Curvularia*, *Cladosporium*, *Epicoccum*, *Nigrospora*, small round spores (*Aspergillus*, *Penicillium*/ *Mucor* type) and pollen grains belonging to families Chenopodiaceae, Amaranthaceae, Poaceae, Asteraceae, Malvaceae, Brassicaceae, *Holoptelea integrifolia*, *Ailanthus excelsa*, *Morus alba*, *Parthenium hysterophorus*, *Salmalia malabarica*, were prevalent in house dust. The miscellaneous matter included hyphae/filaments, fiber, strands, stellate hairs, trichomes, epidermal part with stomata, setae, insect body parts, scales, hairs, etc. It has been found that the essential nutrients of mites are danders, skin scales, pollen grains, fungal spores, litters, dead organic matters, etc, which need special attention in present investigation. The precise identification and population density of HDM are under process.

Asha Khandelwal, Nisha Chandra & Suchit Swaroop [& Rajendra Prasad]

Recognition

A.K. Sinha

Elected Convener of Scientific Programme G 20.10-The Himalayas, 32nd International Geological Congress, Florence, Italy (August 2004).

Chhaya Sharma

Received "Bharatpur Ratn" a award conferred by Kala Mandir, Bharatpur (Rajasthan) in recognition of academic achievements.

J.P. Mandal

Elected Fellow of The Palaeobotanical Society, Lucknow.

C.M. Nautiyal

Awarded 'Meerut Vigyan Ratna' by Science Club and Pragati Vigyan Sansthan, Meerut.

Samir Sarkar

Co-chaired a technical session of the National Seminar on Himalayan Orogen- Foreland interaction held at Department of Geology, Lucknow University, Lucknow during January 2003.

Asha Khandelwal

Chaired a scientific session at 36thAnnual Convention of the Indian College of Allergy, Asthma and applied Immunology, held at Chennai during December 2002.

A. Bhattacharyya

Guest Editor for the Special volume The Palaeobotanist 50(1) on Proceedings of International Symposium on Multifaceted Aspects of Tree Analysis, BSIP, Lucknow (November 2001).

Rashmi Srivastava

Awarded "Chandra Dutt Pant Medal-2002" for the best piece of research work done in the Institute during 1999-2001 (Scientist - C category).

Rajeev Upadhyay

Awarded "Alexander von Humboldt Foundation Fellowship" for working at Institute and Museum of Geology and Palaeontology, University of Tubingen, Germany for a period of one year (w.e.f. 01.02.2003).

A.K. Ghosh

Co-chaired a scientific session 'Palaeoenvironment-Climate Change' in the 8th International Congress on Pacific Neogene Stratigraphy held at Chiang Mai University, Thailand during February, 2003.

Representation in Committees/ Boards

A.K. Sinha

- Chairman, National Committee of the International Lithosphere Program.
- Project-Investigator, International Long Term Programme, Indo-Russian Projects under DST.
- Chief Editor, The Palaeobotanist.
- Member, Local Advisory Committee, Regional Science Centre, Lucknow.
- Member, Scientific Advisory Committee, Research & Development Aspects of Conservation, Ministry of Human Resource Development, Government of India.

Chhaya Sharma

- Vice-President, International Council of Biodeterioration of Cultural Property.
- Member, Advisory Committee, Journal of Bengal Natural History Society.
- Councillor, Executive Council, The Palaeobotanical Society.
- Convener, Pre-Conference Publication Committee.

Jayasri Banerji

- Vice President, The Palaeobotanical Society, Lucknow.
- Member, Editorial Advisory Committee, The Palaeobotanist (w.e.f. 15.01.03).

K.S. Saraswat

- Member, Editorial Board, Ethnobotany.
- Member, Research Degree Committee (Botany), H.N.B. University, Srinagar, Garhwal.
- Member, Executive Committee, Indian Society for Prehistoric and Quaternary Studies, Pune.

K. Ambwani

- Treasurer, The Palaeobotanical Society, Lucknow.
- Convener, In-House Workshop on Electron Microscopy, BSIP.

Rahul Garg

- Member, Editorial Board, Journal of the Palaeontological Society of India.
- Editor, Geophytology.

J.S Guleria

- Editor, Geophytology.
- Member, Executive Council LUBDAA, Lucknow.
- Judge, Science Fiction Writing Event, International Computer Fair and Seminar (COFAS International) held at Lucknow (on September 13).

R.K. Saxena

- Secretary, The Palaeobotanical Society, Lucknow.
- Member, Editorial Board, Geophytology.
- Secretary and Member, Editorial Board, Indian Society of Geoscientists.

A.K. Srivastava

- Chief Editor, Geophytology, The Palaeobotanical Society, Lucknow.
- Joint Secretary, LUBDAA, Lucknow.
- Member, Advisory Board, Journal Neo Botanica.
- Member, Advisory Committee, Journal Vasundhara.
- Member, Editorial Board and Treasurer, Indian Society of Geoscientists.

- Member, National Working Group, IGCP - 411 - Geodynamics of Gondwanaland derived terranes in East and South Asia.

Archana Tripathi

- Member, Jurassic Microfossil Group, International Subcommission on Jurassic Stratigraphy.
- Member, Acritarch Subcommission, Commission Internationale de Microflora du Palaeozoique.
- Member, Spore pollen Working Group, CIMP.
- Member, Subject Expert Committee on Earth and Atmospheric Sciences for WOS-A, DST.
- Editor, Quarterly Journal of Geological Association and Research Centre.

Vijaya

- Corresponding Member, Committee for Quantitative Stratigraphy.
- Voting Member, International Commission on Triassic Stratigraphy.
- Member, National Working Group IGCP Project- 434- Land ocean interaction during Cretaceous in Asia.

Usha Bajpai

- Judge, Computer science fiction.
- Member, Executive Committee, Electron Microscope Society of India.
- Member, Managing Council, Indian Association of Palynostratigraphers.
- Member, Technical Advisory Committee of U.P. Environmental Concern.

Asha Khandelwal

- Member, Editorial Board, Indian Journal of Aerobiology.

B.K. Misra

- Member, Bureau of Indian Standards, Solid Mineral Fuel Sectional Committee-PCD-7.
- Joint Secretary, Indian Society of Geoscientists.

C.M. Nautiyal

- General Secretary, National Children's Science Congress-UP.
- Convenor, NCSTC-Network, New Delhi (up to December 2002)

M.R. Rao

- Joint Secretary, The Palaeobotanical Society, Lucknow.

B.N. Jana

- Member, Executive Council, The Palaeobotanical Society, Lucknow.

A. Bhattacharyya

- Member, Local Organizing Committee, Workshop on Gangotri Glacier, GSI, Lucknow.

A. Rajanikanth

- Assistant Editor, The Palaeobotanist.
- Member, National Working Group IGCP Project- 434- Land ocean interaction during Cretaceous in Asia.

Mukund Sharma

- Assistant Editor, Palaeobotanist

Rajni Tewari

- Member, National Working Group, IGCP - 411 - Geodynamics of Gondwanaland derived terranes in East and South Asia.

Asha Gupta

- Member, Executive Council, Scientist's Unique and Researcher's Yare Association.
- Member, Board of Editors, Flora and Fauna.

Anjum Farooqui

- Executive Member, International Society of Environmental Botanist, NBRI, Lucknow

A.K. Ghosh

- Member, Managing Council, A.P. Sen Memorial Girls' College, Lucknow.

P.S. Katiyar

- Judge, CREATEK event of Computer Seminar and Fair (COFAS), City Montessori School (Stn. Rd.), Lucknow. (September 13)

Y.P. Singh

- Deputy Secretary, Miscellaneous Branch, Kendriya Sachivalaya Hindi Parishad, Lucknow Chapter, Lucknow.

Puneet Bisaria

- Deputy Secretary, City Coordination Committee, Kendriya Sachivalaya Hindi Parishad, Lucknow.
- Secretary, Miscellaneous Branch, Kendriya Sachivalaya Hindi Parishad, Lucknow Chapter, Lucknow.

Lectures Delivered

By Institute's scientists outside:

A.K. Sinha

- Himalaya ki paryavarniy samasyaen (special lecture on Environment Day) at Environment Directorate (UP), Lucknow (May 5, 2002).
- Himalayan tectonic framework (key-note address) at Association of Petroleum Geologists Conference, Mussoorie (September 28, 2002).
- Himalayan mountain building and related problem of land slide management (key-note address) at National Seminar on Natural Hazards in Geological Implication in Hilly regions, Ranchi (November 21, 2002)

Chhaya Sharma

- Holocene climatic reconstruction from lakes of central Ganga Plain at BSIP Auditorium (May, 2002).
- Proxy records of Holocene vegetation and climate change from central Ganga Plain, and Palynology and its application in multidisciplinary research for Teachers of Refresher Course, Allahabad University, Allahabad (January 8, 2003).

Jayasri Banerji

- Plants through Ages at the Refresher Course of UGC Staff College, Lucknow University (October 20, 2002).

Archana Tripathi

- Plants through ages- Palynological approach at the Refresher Course of UGC Staff College, Lucknow University (October 20, 2002).

Rahul Garg

- Mass Extinction at the Cretaceous-Teriary Boundary and Fossil Dinoflagellates at the Refresher Course in Geology (UGC- Academic Staff Collage), Geology Department, Lucknow University (November, 2002).

G.P. Srivastava

- A series of 10 lectures on Angiosperm Taxonomy to M.Sc. Plant Science students of Botany Department, Lucknow University (April-August, 2002).
- Importance of Science Day at Regional Science Centre, Lucknow (February 28, 2002).

C.M. Nautiyal

- Two lectures on Science Communication at Moreh (Manipur), Organised by Manipur Science and Technology and Environment Council under a programme of NCSTC, DST.
- Vigyan Saksharta: Arth ki talash at National Science Communicators' Congress at DST, New Delhi (October, 2002)

R.R. Yadav

- Dendrochronology: applications in environmental research in the Department of Geology, Lucknow University, Lucknow (November 30, 2002).

M.R. Rao

- Spore-pollen- Reliable ecological signatures: Palynology and palaeoecological interpretations of Tertiary sediments of Kerala Basin at W. Szafer Institute of Botany, Department of Palaeobotany, Krakow, Poland (September 23, 2002).

S.K.M. Tripathi

- Palynology and palynological techniques at Geology Department, Lucknow University to the Teachers of Refreshers Course (November 26, 2002).

A. Rajanikanth

- Signatures of past climate at IES, University of Lucknow (January 24, 2003).
- Encryption of past plant life at Kendriya Vidyalaya,

Lucknow (February 28, 2003).
- Environmental awareness through plant studies at IEM, Lucknow (March 15, 2003).

Mukund Sharma

- Stromatolites biostratigraphy and their use in facies and basin analysis in DST sponsored Winter School on Facies and Basin Analysis organized by Department of Geological Sciences, Jadavpur University, Kolkata (December 21, 2002).

B. Sekar

- Importance of C-14 dating and chemical analysis and their application in paleoenvironmental reconstruction at Geoscience and Engineering Department, Anna University, Chennai (July 26, 2002).
- Isotopic dating methods for Archaeology at Department of Ancient History, Culture and Archaeology, University of Allahabad, Allahabad (December 22, 2002).

By outside scientists in the Institute:

Dr. Vladimir N. Sergeev, Geological Institute of Russian Academy of Sciences, Moscow
- Proterozoic cyanobacteria and protista: Evolution and distribution (April 05, 2002)

Sri. J. Carlos Calazans, Advanced School of Studies, Sorbonne, Paris
- Changing impact of Climate on European Trade during 16-17th Centuries (April 12, 2002)

Dr. Avinash Chandra, Director General, Hydrocarbon Board of India, Ministry of Petroleum, New Delhi
- Oil and Gas exploration in the Sedimentary Basins of India (April 24, 2002)

Prof. Hans Hofmann, Department of Earth and Planetary Sciences, McGill University, Montreal, Canada
- Early life on Earth (December 13, 2002)

Prof. Dr. Cheng-Sen Li, Institute of Botany, Chinese Academy of Sciences, P.R.China
- Studies of Fossil Plants in China (January 15, 2003)

Prof. Yu-Fei Wang, Institute of Botany, Chinese Academy of Sciences, Beijing, P.R.China
- Neogene Floras and Climate changes in China (January 15, 2003)

Deputation/Training/Study/Visit Abroad/in Country

C. M. Nautiyal, A. Rajanikanth & S.C. Bajpai

Attended World Summit on Sustainable Development, Northern Regional Consultative Workshop, Centre for Environment Education held at BSIP Auditorium, Lucknow on April 2, 2002.

C.M. Nautiyal

Attended Meeting on Climate Change at India International Centre, New Delhi on May 20, 2002, organised by IIT, Delhi and WWF-India.

A.K. Sinha & B.D. Singh

Visited Ranchi in June 2002 and had discussions with Chief Secretary, Development Commissioner and Secretary (Science and Technology) of Jharkhand Government regarding the Institute's proposal for developing Birbal Sahni Memorial Fossil Park and Museum in Rajmahal Hills. Later, Sinha also visited (during December 4-5, 2002) District headquater at Sahibganj for further discussion with officials regarding development and sites of Fossil Park and Museum.

B.K. Misra, Alpana Singh & B.D. Singh

Visited Central Mining Research Institute (CMRI), Indian School of Mines (ISM) and Central Fuel Research Institute (CFRI) at Dhanbad, Jharkhand during June 2002. Had discussions with scientists engaged in studies related to coal petrography, coal chemistry and coal bed methane aspects. Explore the possibility for organizing a National Seminar on coal science with scientists of CFRI. Finalized a project proposal entitled "Gas desorption, petrological studies and reservoir modeling for coal bed methane exploration in Bokaro Coalfield" in collaboration with scientists of CMRI and submitted to Directorate of Hydrocarbons, New Delhi for consideration.

Jayasri Banerji, A.K. Srivastava, G.P. Srivastava, Archana Tripathi & B.D. Singh

In connection with the establishment of Birbal Sahni Memorial Fossil Park and Museum visited (during July 8-14, 2002) the site area proposed for museum near Sahibganj and in situ Fossil Park near Mandro and other fossil localities of Rajmahal Hills. Detail discussions with District and Forest officials were held at Sahibganj and proposal has been submitted to Jharkhand Government.

A.K. Sinha

Visited New Zealand to attend International Lithosphere Programme (ILP) Bureau Meeting (Western Pacific Geophysics Meeting) as Chairman, Committee of National Representatives. The meeting was held at Wellington during July 9-12, 2002.

P.S. Katiyar & Y.P. Singh

Attended Workshop on Application of Internet/ Intranet in Retrieval of Scientific Information and Database Search Techniques held at CIMAP, Lucknow from July 15-16, 2002.

S.K. Bera

Attended Project Advisory Council Meeting at DST, New Delhi on July 29, 2002 for finalization of a joint Indo-Russian collaborative project entitled "Palynostratigraphical and Chronological studies on lake sediments, Schirmacher Oasis, East Antarctica" with NCAOR, Goa.

B.D. Singh

After attending the International Conference held at Banff, Canada visited the well-equipped laboratories of Chairperson of Conference Dr. Martin G. Fowler, Organic Geochemist and Vice-Chairperson Dr. Lavern D. Stasiuk, Organic Petrologist at Geological Survey of Canada, Calgary from September 5-15th, 2002. During this period had discussions with them and others and got acquainted with solvent extraction, TOC and gas chromatography methodologies, and spectral fluorimetric analysis of liptinite maceral group on a set of Indian coal samples.

Visited Commonwealth Science Council and different Science Museums at London during September 17-19th, 2002. Also visited Germany for scientific

discussions at Institute of Mineralogy (at Frankfurt) and at Institute of Petroleum Geochemistry and coal (at Aachen) during September 20-23rd, 2002. Discussed with concerned scientists about various methodologies of optical microscopy and geochemical techniques. Dr. Wilhem Püttman (Frankfurt) has agreed for molecular analysis on Indian set of coal samples to trace the origin of sporinite.

Archana Tripathi

After attending the International Meeting held at Lille (France) in September 2002, visited the Palaeozoic Laboratory of Palaeontology and Palaeogeography, University of Lille, and Natural History Museum (at Lille). On way to Italy visited Research Unit Palaeontology, Ghent University and Laboratory of Palaeontology, Palaeopalynology and Micropalaeontology, University of Liege in Belgium. Also visited Museum Brancaleoni, Piobbico, Italy. The museum has very rich collection of Jurassic ammonoids.

Jyotsana Rai

After attending the International Conference held in Italy (in September 2002), participated in an excursion to Ligurian Coast: The Tuscanid Succession showing Late Triassic-Cretaceous, Oligocene and Miocene age rocks.

Madhav Kumar

Visited Cell Biology and Evolutionary Micropalaeontological Laboratory, University of Szeged, Hungary from September 7-October 18, 2002 under bilateral Scientific Exchange Programme between Indian National Science Academy and Hungarian Academy of Sciences.

M.R. Rao

Visited Poland during September 18-October 20, 2002 under bilateral Scientific Exchange Programme between Indian National Science Academy and Polish Academy of Sciences.

Anupam Sharma

Visited Jawaharlal Nehru University, New Delhi from September 25-October 6, 2002 for analysis of water samples of Himalayan region.

A.K. Srivastava, J. S. Guleria, Manoj Shukla, A. Rajanikanth, Mukund Sharma & S.C. Bajpai

Attended National Roving Seminar on Intellectual Property Rights in Biotechnology held at CIMAP, Lucknow on October 4, 2002.

Binita Phartiyal

Attended short course on Palaeoseismicity, sponsored by DST and organized at Department of Geology, Panjab University, Chandigarh from October 8-11, 2002.

Visited Wadia Institute of Himalayan Geology, Dehradun from November 19- December 20, 2002 for analysis of Quaternary samples at Palaeomagnetic Laboratory (in collaboration with Dr. S.J. Sangode).

Supriya Chakraborty

Visited Physical Research Laboratory, Ahmedabad for technical discussion in relation to the fabrication of a benzene extraction system in October 2002.

Vandana Chaudhary

Attended Seminar cum Workshop on Geographical Information Systems- Geoscientific and Geotechnical Applications held at Panjab University, Chandigarh during October 23-24, 2002.

G.P. Srivastava & Rashmi Srivastava

Attend a meeting with Commissioner of Jabalpur Division (MP) and other district officials at Jabalpur on October 25, 2002. Provided expert technical advise for construction of a Museum and development of National Fossil Park at Ghughua.

Usha Bajpai

Attended the EM user meet held at AIIMS, New Delhi on November 15, 2002.

G.P. Srivastava

Attended meeting of International Council of Museum Asian Workshop on Museum Visitors on November 24th, 2002, and ICOM International Committee for Training of Personnel during November 25-29, 2002 held at National Museum, New Delhi.

Manoj Shukla, Mukund Sharma & Rupendra Babu

Attended International Field Workshop on the Vindhyan Basin, Central India from December 3-11, 2002 organized by The Palaeontological Society of India and Department of Geology, Lucknow University. Visited 22 localities in eastern part of Vindhyan Basin exposing complete succession from its lower contact with Bijawar phyllites exposed between Dala Cement Factory and Renukoot to the youngest horizon Maihar Sandstone exposed at the top of scarp on Maihar Rampur road section.

A. Bhattacharyya

Attended Programme Advisory and Monitoring Committee (PAMC) meeting for the approval of a new project from the Eastern Himalaya held on December 5, 2002 at the Geology Department, Ranchi University, Ranchi.

Presented progress report of Gangotri Glacier project at the 2nd meeting of the PAMC on Himalayan Glaciology held on March 21-22, 2003 at Remote Sensing Application Center, Uttar Pradesh.

Mukund Sharma

Participated as Resource Person in DST sponsored Winter School on Facies and Basin Analysis organized at Jadavpur University, Kolkata in December 2002 and delivered a lecture.

A. Rajanikanth

Attended Seminar on Enhancement of Environmental status through better management and techniques held at IES, University of Lucknow from January 24-25, 2003.

Jyotsana Rai & Asha Gupta

Participated in post-seminar (Himalayan Orogen-Foreland Interaction, January-February 2003) field excursion to the banks of river Yamuna near Kalpi (UP).

Ratan Kar

Attended the Group Monitoring Workshop on the Young Scientists Fast Track Projects organized by DST and held at NIO, Goa during January 11-12, 2003.

R.K. Tantua

Attended 12 weeks Orientation Course in Museology and Conservation held at Allahabad from August 19-November 18, 2002.

I.J. Mehra, Puneet Bisaria & S.S. Panwar

Attended two days collaborative Hindi Workshop held at C.D.R.I, Lucknow from June 26-27, 2002.

K.S. Saraswat & Puneet Bisaria

Attended half yearly meeting of NARAKAS held at C.D.R.I, Lucknow on August 29, 2002. Bisaria also attended next half yearly meeting at the same venue on February 26, 2003.

Attended two days National Conference on Human health and environment held at C.D.R.I, Lucknow from November 14-15, 2002.

Neerja Jha, Mukund Sharma & Puneet Bisaria

Attended Hindi Karyashala on Hindi Mein Vaigyanik Lekhan held at Department of Linguistics, Lucknow University, Lucknow from September 20-22, 2002.

Mukund Sharma & Puneet Bisaria

Attended National Workshop on Vigyan ke badhte charan sponsored by Vigyan Parishad, Prayag and held at Geology Department, Lucknow University, Lucknow from October 1-2, 2002.

Puneet Bisaria

Attended Official Language Workshop held at Kendriya Sachivalaya Hindi Parishad, Lucknow on October 20, 2002; Conference on Netaji Subhash Chandra Bose sponsored by Kendriya Sachivalaya Hindi Parishad held at L.P. LAL Public School, Lucknow on January 23, 2003; and Conference on Bhoomandalikaran ke pariprekshya mein Hindi ki bhoomika held at New India Assurance Company Limited, Lucknow on January 30, 2003.

A. Rajanikanth, Puneet Bisaria & S.R. Ali

Attended Pratham Akhilabharatiya Rashtriya Rajbhasha Sammelan on Scientific Terminology and Official Language management organised by DST, New Delhi and held at Vigyan Kendra, CSIR Bhavan, New Delhi from March 6-7, 2003.

R.K. Takru

Attended the Meeting of The Registrars / Administrative Officers / Financial Officers / Accounts Officers of the Autonomous Bodies of Department of Science & Technology held at New Delhi on March 11, 2003

Deputation to Conferences/Symposia/Seminars/Workshops

S.K. Bera

- Joint Workshop under ILTP for Indo-Russian Scientific Collaboration in Polar Science held at NCAOR, Goa from April 9-12, 2002.
- National Seminar India in the Antarctic: Challenge and Opportunities for the 21st Century held at Centre for the study of Geopolitics, Panjab University, Chandigarh from February 3-4, 2003.

S.K. Bera & Rajeev Upadhyay

- Workshop on Remote Sensing and GIS for Natural Resources Management held at Remote Sensing Application Centre, Lucknow from May 14-15, 2002.

A.K. Sinha, B.K. Misra, Alpana Singh & B.D. Singh

- Geotechniques: 2002- National Seminar on Modern Trends in Geo-scientific Techniques held at Central Mine Planning and Design Institute Ltd., Ranchi from June 10-11, 2002.

B.D. Singh

- CSCOP-TSOP 2002- International Conference on Emerging Concepts in Organic Petrology and Geochemistry (including Dr. Archie G. Douglas Symposium) and Short Course on Predicting Organic Carbon and Hydrogen in Marine Sediments held at Banff (near Calgary), Alberta, Canada from August 31- September 04, 2002.

Archana Tripathi

- International Meeting and Workshop on Palynology in Third Millenium: New Directions in Acritarch, Chitinozoan and Miospore Research held at Lille, France from September 5-7, 2002.

Jyotsana Rai

- 9th International Nannoplankton Association Conference held at Parma, Italy from September 8-14, 2002.

Archana Tripathi & Jyotsana Rai

- 6th International Symposium on the Jurassic System held at Mondello, Sicily, Italy from September 12-22, 2002.

A.K. Sinha

- Association of Petroleum Geologists Conference and Exhibition held at Mussoorie from September 27-29, 2002.
- National Seminar on Natural Hazards: Its Geological Implications in Hilly Regions held at St. Xavier's College, Ranchi from November 21-23, 2002.
- Petrotech-2003- 5th Internatioanl Petroleum Conference and Exhibition held at New Delhi from January 9-12, 2003.

R.R. Yadav

- 68th Annual Meeting of Indian Academy of Sciences (Bangalore) held at Panjab University, Chandigarh from November 8-10, 2002.

Majority of the Scientific Staff of Institute

- National Conference on Biodiversity- Past and Present held at BSIP, Lucknow from November 28-29, 2002.

Asha Khandelwal

- 36thAnnual Convention of Indian College of Allergy, Asthma and applied Immunology held at Chennai from December 12-15, 2002.

K.S. Saraswat, Chanchala Srivastava & A.K. Pokharia

- National Seminar on Maritime Heritage of India and Joint Annual Conference: Indian Archaeological Society XXXVI, Indian Society for Prehistoric and Quaternary Studies XXX and Indian History and Culture Society XXVI held at Tripunithura, Kerala from December 19-22, 2002.

A.K. Sinha & A. Rajanikanth

- 90th Session Indian Science Congress held at Bangalore from January 3-7, 2003.

O.S. Sarate & B.D. Mandaokar

- National Conference on Recent Advances in Botany held at J.M. Patel College, Bhandara, Maharashtra from January 28-29, 2003.

A.K. Sinha, Anupam Sharma & Binita Phartiyal

- 6th Annual International Conference Map India 2003 held at New Delhi from January 28-31, 2003.

R.R. Yadav, Samir Sarkar, Ram Awatar, Jyotsana Rai, Asha Gupta & Vandana Prasad

- National Semunar on Himalayan Orogen- Foreland Interaction held at Lucknow University, Lucknow from January 29-30, 2003.

A.K. Ghosh

- 8th International Congress on Pacific Neogene Stratigraphy held at Chiang Mai University, Thailand from February 2-9, 2003.

B. Sekar

- IGCP Seminar on Dating methods and Paleoenvironments during the Quaternary held at Anna University, Chennai on February 8, 2003.

S. Chakraborty, B. Sekar, Vandana Chaudhary, P.S. Ranhotra & S.K. Shah

- Workshop Late Quaternary Environment Change: Emerging Issues (ELIQUEC & POLTRAIN 2003) held at French Institute, Pondicherry from February 10-15, 2003.

Rashmi Srivastava

- International Workshop on Silicified Woods from Java Island, Indonesia held at Wood Research Institute, Kyoto University, Kyoto, Japan from February 19-25, 2003.

R.R. Yadav, A. Bhattacharyya, Asha Gupta, P.S. Ranhotra & Jayendra Singh

- Workshop on Gangotri Glacier held at Geological Survey of India (Northern Region), Lucknow from March 26-28, 2003.

Papers presented at Conferences/Symposia/Meetings

Agarwal A & Mandaokar BD - A fossil fruit resembling *Terminalia belerica* (Gaertn) Roxb. from the Bhuban Formation (Early Miocene) exposed at Sesawng, Aizawal District, Mizoram. Nat. Conf. Biodiversity-Past and Present, Lucknow, November 2002.

Ambwani K, Kar RK, Srivastava R & Dutta D- Occurrence of urticaceous fruit from Deccan Intertrappean Beds of Mohgaon Kalan, Chhindwara District, Madhya Pradesh. Nat. Conf. Biodiversity-Past and Present Lucknow, November 2002.

Banerji J & Ghosh AK - Diversity of Early Cretaceous Megaflora from Hiranduba locality of Rajmahal Basin, Jharkhand. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Bera SK - Palynostratigraphical and chronological studies on lake sediments in Schirmacher Oasis, East Antarctica. Workshop Indo-Russian Scientific collaboration in Polar Science, Goa, April 2002.

Bera SK - Evidence of long distance transported pollen and spores retrieved from lichen patches in Schirmacher Oasis, East Antarctica. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Bera SK - Proxy pollen data retrieved from terrestrial deposits in and around Schirmacher Oasis, East Antarctica. Nat. Sem. India in the Antarctic-Challenges and Opportunities for the 21st Century, Punjab Univ., February 2003.

Bera SK & Sekar B - Climate and vegetation during late Holocene in Anamalai Hill, South India. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Bera SK, Yadav RR & Singh J - Vegetation and climate change during late Holocene in Western Himalaya using pollen and tree ring proxy data. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Bhattacharyya A, Chaudhary V & Shah SK - Tree-ring analysis of tropical Indian trees. South Asian PAGES Workshop and Training Program, Pondicherry, February 2003.

Bhattacharyya A & Ranhotra PS - Late Holocene vegetation and climatic changes around Tapoban, Gangotri Glacier, Garhwal Himalaya. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Bhattacharyya A & Ranhotra PS - Post glacial climatic changes around Gangotri Glacier, Western Himalaya. Workshop on Gangotri Glacier, GSI, Lucknow, March 2003.

Bhattacharyya A, Ranhotra PS & Basavaiah N - Late Holocene vegetation and climatic changes around Tapoban Gangotri Glacier, Garhwal Himalaya. South Asian PAGES Workshop and Training Program, Pondicherry, February 2003.

Bhattacharyya AP & Srivastava AK - Mioflora and vertically preserved Vertebraria - axes from Permian sediments of Darjeeling Hills, West Bengal. Nat. Conf. Biodiversity - Past and Present, Lucknow, November 2002.

Chakraborty S - Coral records provide a unique means to investigate monsoon variabilities. Workshop Late Quaternary Environment Change: Emerging Issues, Pondicherry, February 2003.

Chandra A, Fenner J, Saxena RK & Rüthnick M - A general account of the siliceous microfossils from Neogene deposits of Neill Island, India. Nat. Conf. Biodiversity-Past and Present, Lucknow, November 2002.

Chauhan MS, Sharma C, Singh IB & Sharma S - Proxy records of Late Holocene vegetation and climatic change from Basaha Jheel, Central Ganga Plain-II, Uttar Pradesh. Nat. Conf. Biodiversity-Past and Present, Lucknow, November 2002.

Dubey B, Yadav RR & Singh J 2002. Tree-ring based growth analysis of *Cedrus deodara* in a moisture stressed site in Uttarkashi, Uttaranchal. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Farooqui A - Mangrove vegetation during Holocene in the south-east coastal areas of India. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Farooqui A, Farooqui SA & Sekar B - Vegetation pattern since 4000 yrs. BP in Lalitpur, India: Mansarovar Lake- a case study, ELIQUEC & POLTRAN 2003, Pondicherry, February 2003.

Faruque BM, Lahiri A, Mathur AK, Shrivastava PC, Sharma C & Rajagopalan G - Signatures of climatic changes during last 5000 years in the Nizampatnam Bay sediments. 4th South Asia Geol. Congr. GEOSAS-IV, New Delhi, November 2002.

Garg R - An Early Maastrichtian calcareous nannofossil assemblage from the Mahadeo Formation, Therriaghat area, Khasi Hills, Meghalaya. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Garg R, Khowaja-Ateequzzaman & Prasad V - Late Palaeocene dinoflagellate cysts from Jathang, Mawsynram area, Khasi Hills, Meghalaya. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Ghosh AK - Mass extinction during end Cretaceous and its impact on the diversity of benthic calcareous algae. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Ghosh AK - Corallinacean and Halimedacean algae from the Neogene strata of India and their implications on palaeoenvironment. 8th Int. Congr. Pacific Neogene Stratigr., Thailand, February 2003.

Guleria JS - Some plant megafossils from the Lower Tertiary sediments of Barmer, Rajasthan. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Gupta A - Floral and faunal remains capable to unravel concealed neotectonic disturbances in Himalaya. Workshop Gangotri Glacier, Lucknow, March 2003.

Jana BN - Diversities in the Lower Cretaceous fossil flora of Dhrangadhra Formation, Gujarat. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Jha N - Permian palynostratigraphy in Chintalpudi sub-basin, Andhra Pradesh. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Kar R - Palynological correlation of the Barakar sediments from Sursa Block, Tatapani-Ramkola Coalfield, Chhattisgarh: Significance in coal exploration. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Khandelwal A, Prasad R, Chandra N & Swaroop S - Incidence of bioallergens in house dust samples of asthmatic patients of Lucknow, India. 36th Annual Conv. Indian College of Allergy, Asthma & Applied Immunobiology, Chennai, December 2002.

Khandelwal A, Swaroop S & Chandra N - House dust mites and their allergenic significance. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Kumar M - Palynomorphs and palynofacies patterns in an Early Eocene deposit near Barpathar, Upper Assam. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Mandal JP - Phytogeographical significance of *Dakshinipollenites* recorded from the early Eocene sediments of Kutch Basin. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Mandang Y, Kagemori N, Srivastava R, Terada K & Hadiwisastra S - Pliocene woods from Tenjo, West Java, Indonesia. Int. Workshop Silicified Woods from Java Island, Indonesia, Kyoto, Japan, February 2003.

Mandaokar BD - A report on Tertiary plant and animal megafossils from Arunachal Pradesh, Nat. Conf. Recent Advances in Botany, Bhandara, January 2003.

Mandaokar BD, Mehrotra RC & Mazumder BI - Two fossil woods from the Tertiary of Karimganj, Assam, India. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Mehrotra RC, Pande N & Ralimongla - Two fossil woods from Miocene of Changki, Mokokchung District, Nagaland, Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Misra BK & Singh BD 2002. Fluorescing macerals: an update, with special reference to Indian coals and lignites. Int. Conf. Emerging Concepts in Organic Petrology and Geochemistry, Banff, Canada, August-September 2002.

Misra BK, Singh BD & Singh A 2002. Significance of coal petrology in coal bed methane research. Geotechniques: 2002- Nat. Sem. Modern Trends in Geo-scientific Techniques, Ranchi, June 2002.

Prakash N - Reappraisal of Athgarh flora with remarks on its age. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Prasad M - Plant fossils from Siwalik sediments of Himachal Pradesh and their palaeoclimatic significance. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Prasad M & Khare EG - Cuticular study of the fossil leaves from Siwalik sediments of Arjun Khola sequence, Western Nepal. Nat. Conf. Biodiversity-Past and Present, Lucknow, November 2002.

Prasad V & Sarkar S - Palaeo-oxygenation of Subathu epicontinental sea- Evidence from palynofacies analysis. Nat. Sem. Biodiversity- Past and Present, Lucknow, November 2002.

Rai J - Calcareous nannofossils from Maniara Fort Formation (Oigocene, South-Western Kachchh (=Kutch), western India. 9th Int. Nannoplankton Assoc. Conf., Italy, September 2002.

Rai J - Early Callovian nannofossils from Kuldhar, Jaisalmer Basin, Rajasthan, Western India. 6th Int. Symp. Jurassic System, Italy, September 2002.

Rai J, Garg R & Kumar S - Early Campanian nannofossils from Chakrud near Zeerabad, Bagh area: Stratigraphic and palaeoenvironmental implications. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Rai J, Upadhyaya R & Sinha AK - The dawn of nannofossils in the cradle of Ladakh. Nat. Sem. Himalayan Orogen- Foreland Interaction, Lucknow, January 2003.

Ram-Awatar - Early Triassic palynoflora from Son Graben, Madhya Pradesh. Nat. Conf. Biodiversity-Past and Present, Lucknow, November 2002.

Ram-Awatar & Chakraborty B - Inter-relationship of palynofloral assemblage from Raigarh Gondwana Basin, Chhattisgarh, India. Nat. Conf. Biodiversity-Past and Present, Lucknow, November 2002.

Rao MR - Palaeoecological and stratigraphical significance of fungal remains from Sindhudurg Formation, Sindhudurg District, Maharashtra. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Saini DC, Vethnayagam SM & Pradhan S - Hidden truths about the medicinal uses of Amarkantak flora of Shahdol district in Madhya Pradesh. Nat. Conf. Biodiversity-Past and Present, Lucknow, November 2002.

Saraswat KS - Agricultural economy at Neolithic-Chalcolithic Senuwar (ca. 2200-600 B.C.), District Rohtas, Bihar. Nat. Sem. Maritime Heritage of India & Joint Ann. Conf. Indian Archaeol. Soc. XXXVI, Indian Soc. Prehistoric and Quaternary Studies XXX & Indian History and Culture Soc. XXVI, Kerala, December 2002.

Saraswat KS & Pokharia AK - A pivotal botanical evidence of pre-Columbian contact between Asia and America. Nat. Sem. Maritime Heritage of India & Joint Ann. Conf. Indian Archaeol. Soc. XXXVI, Indian Soc. Prehistoric and Quaternary Studies XXX & Indian History and Culture Soc. XXVI, Kerala, December 2002.

Sarate OS - Wardha Valley coals of Maharashtra, their biopetrology and depositional environment. Nat. Conf. Recent Advances in Botany, Bhandara, January 2003.

Sarate OS & Rao VS - Biopetrology of the coals from Srirampur, Hemchandrapuram and other areas of the Kothagudem sub-basin, Godavari Valley Coalfield, Andhra Pradesh. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Sarkar S & Corvinus G - A Siwalik palynoflora (Late Miocene) from the Rehar area of Nepal and its palaeoecological significance. Nat. Sem. Himalayan Orogen- Foreland Interaction, Lucknow, January 2003.

Sarkar S & Prasad V - Palynofloral changes across Late Ypresian- Lutetian sediments of the Subathu Formation, Morni Hills, Haryana. Nat. Sem. Himalayan Orogen- Foreland Interaction, Lucknow, January 2003.

Saxena RK & Sarkar S - Palynological investigation of the Boldamgiri Formation of West Garo Hills, Meghalaya. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Saxena RK & Tripathi SKM - Palynological investigation on Siwalik sediments exposed near Hardwar, Uttaranchal. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Sekar B - Isotopic dating methods and their applications. IGCP Sem. Radiometric Methods and Quaternary Palaeoclimate, Chennai, February 2003.

Shah SK, Chaudhary V & Bhattacharyya A - Tree ring analysis of Teak (Tectona grandis L.) from Hoshangabad, Madhya Pradesh, India. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Sharma M - Biodiversity in Proterozoic basins of India. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Sharma S, Joachimski M, Sharma M, Tobschall HJ, Singh IB, Sharma C, Chauhan MS, Morgenroth G, Agarwal PN & Saxena A - Monsoon variability reconstruction for last 15 ka in Ganga plain using multiproxy data. 5th Int. Meet. Global Continental Palaeohydrol. GLOCOPH-2002, Pune, December 2002.

Singh J & Yadav RR 2003. Spring temperature fluctuations in western Himalaya since AD 1600: as inferred from tree rings. Workshop on Gangotri Glacier, GSI, Lucknow, March 2003.

Singh J, Yadav RR & Chaturvedi R 2002. Development of multi century long ring-width chronologies for the western Himalaya. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Singh KJ, Goswami S & Chandra S - First comprehensive investigation of Karharbari megaflora in Mahanadi Basin, India. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Singh RS & Kar R - Palynological study of the Deccan intertrappean sediments from Gurumatkal, Karnataka, India: Stratigraphical correlation and palaeoecological interpretations. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Srivastava AK - Foliar diversity in Gondwana Succession of India. Nat. Conf. Biodiversity - Past and Present, Lucknow, November 2002.

Srivastava AK & Tewari R - Taxonomic status of Cordaitalean leaves of Indian Gondwana. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Srivastava C - Emerging trends of archaeobotanical investigations in Rapti Valley, Districts Bahraich and Sravasti, U.P. Nat. Sem. Maritime Heritage of India & Joint Ann. Conf. Indian Archaeol. Soc. XXXVI, Indian Soc. Prehistoric and Quaternary Studies XXX & Indian History and Culture Soc. XXVI, Kerala, December 2002.

Srivastava C & Sharma C - Proxy records of Holocene vegetation and climate of extinct saline lake in Barmer district, western Rajasthan. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Srivastava R - Neogene flora of India with special reference to Southeast Asian elements. Int. Workshop Silicified Woods from Java Island, Indonesia, Japan, February 2003.

Srivastava R & Ambwani K - Fossil wood of *Sonneratia* infected with endogenous fungi from Deccan Intertrappean Beds of Seoni District, Madhya Pradesh. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Srivastava R & Guleria JS - A fossil wood of Anacardiaceae from Deccan Intertrappean sediments of Betul District, Madhya Pradesh. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Tewari R - Gondwana megaspores- Distribution pattern and structural diversity. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Tripathi A - Unique organic remains from Upper Permian coal bearing horizon in Talcher Coalfield, Orissa, India. Int. Meet. Workshop Palynology in Third Millennium: new directions in acritarch, chitinozoan & miospore research, France, September 2002.

Tripathi A - Plants through ages: Palynological evidences and Jurassic sedimentation in Rajmahal Basin, India. 6th Int. Symp. Jurassic System, Italy, September 2002.

Tripathi A & Ray A - Report of dinoflagellates from Rajmahal Basin, Jharkhand, India. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Tripathi PP, Pandey SM & Prasad M - Angiospermous leaf impressions from Siwalik sediments of Himalayan foot hills and their bearing on palaeoclimate. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Tripathi SKM - Palynological studies from Late Palaeocene sediments of Giral Lignite mine, Barmer, Rajasthan, India. Nat. Conf. Biodiversity- Past and Present, Lucknow, November 2002.

Yadav RR - Climate variability in the Indian region: high-resolution proxy records. 68th Ann. Meet. Indian Acad. Sci., Chandigarh, November 2002.

In-house Workshop on SEM

Institute organized an In-house Workshop on Scanning Electron Microscope (SEM) during June 27-28, 2002 with an aim to acquaint geoscientists and biologists with the immense analytical power that can be availed through the use of the Scanning and Transmission Electron microscopes. The workshop covered the following themes:

- Introduction to electron microscopy and image analysis using SEI and BEI detectors.
- EDAX and its application.
- Use of SEM in Palaeobotanical researches.
- Sample preparation techniques- for oriented and un-oriented samples.

Lectures were delivered by experts on following topics:

- Electron Microscopy of biomineralized tissue and EDX analysis - Prof. Ashok Sahni
- Preservation and Presentation of the EM data - Prof. Ashok Sahni
- Basic Principal and Application of EM in Biological Sciences - Dr. V.K. Bajpai
- Evolutionary techniques in SEM: The Quanta Series from FEI - Sri. Anand V. Rao

In the practical session Prof. Ashok Sahni demonstrated about the stereoscopic images, Dr. (Smt..) Neera Sahni and Sri. V.K. Singh discussed the basic working principles and about the working of EDX system. Drs. K. Ambwani and Usha Bajpai demonstrated the different techniques involved in sample preparation for SEM.

All the scientific and technical staff of the Institute participated in this workshop. Besides, two candidates each from NBRI, ITRC and GSI and one from CIMAP also attended the workshop. Following scientific and technical personnels participated in the practical demonstration:

Dr. Anil Agarwal
Dr. Khowaja Ateequzzaman
Dr. Ram Awatar
Smt. Rita Banerjee
Dr. (Smt.) Madhabi Chakraborty
Dr. A.K. Dwivedi (NBRI)
Dr. Anjum Farooqui
Dr. Rahul Garg
Smt. Indra Goel
Smt. Asha Guleria
Dr. S.K. Gupta (ITRC)
Dr. Asha Khandelwal
Dr. E.G. Khare
Sri Ajaya Kumar (CIMAP)
Dr. Madhav Kumar
Sri V.P. Misra (GSI)
Sri Shambhu Nath (GSI)
Sri. Chandra Pal
Dr. Binita Phartiyal
Sri. S.K. Pillai
Dr. Neeru Prakash
Dr. Vandana Prasad
Dr. Jyotsana Rai
Dr. A. Rajanikanth
Dr. Mukund Sharma
Sri Satish Shukla (ITRC)
Dr. Manoj Shukla
Dr. Alpana Singh
Sri. V.P. Singh
Dr. A.K. Srivastava
Dr. Rashmi Srivastava
Sri. A.K. Srivastava
Dr. M.R. Susheela (NBRI)
Dr. Rajni Tewari
Dr. Archana Tripathi
Dr. S.K.M. Tripathi
Dr. Rajeev Upadhyay
Dr.Vijaya

Consultancy/Technical Assistance rendered

The consultancy services were provided to the following Institutes/Organizations for radiocarbon dating of a variety of samples:

Agharkar Research Institute, Pune
Anna University, Chennai
Archaeological Survey of India
Center for Earth Science Studies, Trivandrum
Cochin University, Cochin
Deccan College, Pune
Geological Survey of India
Kumaon University, Nainital
M.S. University of Baroda, Vadodara
National Institute of Oceanography, Goa
Oil and Natural Gas Corporation Limited
Wadia Institute of Himalayan Geology, Dehradun

SEM Unit has provided consultancy services in Scanning Electron Microscopy to the scientists/scholars of various institutions and universities of India:

Department of Botany, Lucknow University, Lucknow
Department of Zoology, Lucknow University, Lucknow
Faculty of Dental Sciences, KGMC, Lucknow
G.B. Pant University of Agriculture and Technology, Pantnagar
National Botanical Research Institute, Lucknow

G.P. Srivastava & Rashmi Srivastava provided expert advise for the establishment of National Fossil Park at Ghughua, Dindori District, M. P. and in setting up Museum and study centre.

Manoj Shukla provided training for the isolation of microbiota from the Precambrian sediments to Sri. V.K. Singh, Research Scholar, Lucknow University.

J.S. Guleria provided scientific assistance in microphotography to Miss Archana Gupta, JRF (CSIR) of the Department of Zoology, Lucknow University. Help rendered also to Commissioner Jabalpur Division (MP) in identifying two fossil samples.

Chanchala Srivastava rendered scientific assistance to Ms Anupam Upadhyay, M.Sc. student of Environmental Sciences, Lucknow University for her summer training project, based on the rich assemblage of crop finds and associated weeds and wild taxa retrieved through morphological investigation of seed and fruit remains from the ancient Pirvitani Sariff site.

R.C. Mehrotra provided scientific assistance to Miss Priyanka Dixit, M.Sc. student (Environmental Science, II Semester) of Lucknow University for her project entitled "Fossil history, ecology and allergenic significance of *Eucalyptus* and *Alianthus* in India".

A. Bhattacharyya provided scientific assistance to Ms Priyanka Verma, M.Sc. student for her dissertation "Analysis of growth rings of Teak for climatic studies" of Department of Environmental Sciences, Lucknow University.

Anjum Farooqui provided scientific assistance to Ms. Toshita Joshi of Lucknow University for her M.Sc. Semester II Dissertation (Environmental Sciences) work.

Punit Bisaria provided administrative assistance to 30 students of B.A (III Year), Functional Hindi of Lucknow University.

Units

Publication

Journal- The Palaeobotanist

Volumes 50(1), 50(2-3) and 51(1-3) of the Journal are published incorporating research papers on various topical aspects, maps and figures. Two issues of Volume 50 (1 & 2-3) are the Golden Jubilee volumes of the Journal. Papers for the Volume 52 are being processed.

Monograph

A monograph entitled ''Introduction to Gymnosperms, *Cycas* and Cycadales'' authored by late Prof. D.D. Pant is published. Another monograph "Coal Petrology in India" by Dr. H.S. Pareek is under process.

Newsletter

Newsletter 2002 is published with information on important activities of the Institute including important research finds, science meet reports, participation in exhibitions, conferences, *Hindi Pakhwara* (fortnight), new additions to library, and related information along with pertinent photographs.

Annual Report

Bilingual (English/Hindi) Annual Report (2001-2002) of the Institute was published consisting of Research reports, Conference/Symposia participation, Awards, Research papers/Abstracts published,

Foundation/Founder's Day function, Annual Accounts and related matters with relevant graphics and photographs.

Museum Inventory

Museum Inventory entitled "Type and Figured specimens at the Repository- An Inventory Part-III" (compiled by G.P. Srivastava & Sunita Khanna) was published.

Hand-outs

Biographical sketches and Lecture themes of talks delivered on Foundation Day and Founder's Day by the guest speakers- Dr. Lalji Singh, Director (CCMB, Hyderabad); Professor Obaid Siddiqi, FRS (NCBS, Bangalore); and Professor M.S. Srinivasan, INSA (Hon.) Scientist (BHU, Varanasi) were published.

A vivid and well-designed information Brochure on Institute is published depicting the activities of the Institute. Bilingual biographic sketch of the Founder Professor Birbal Sahni, FRS depicting his life and times was also published.

International Conference

A folder on International Conference on Changing Scenario in Palaeobotany and allied Subjects (proposed to be held at BSIP in November 2003) was published.

A view of Foundation Day Celebration graced by Acharya Vishnu Kant Shastri, Governor, UP.

Library

Library services have been provided to its users efficiently. The contents of the new arrivals and current awareness service (CAS) are also made available on the Institute web site (http://www.bsip.res.in)

The current holdings of library are as under:

Particulars	Additions during 2002-03	Total
Books	74	5,469
Journals	979	11,811
Reprints	76	36,657
Reference Books	02	321
Hindi Books	44	197
Ph.D. Thesis	-	91
Reports	-	46
Maps & Atlases	-	61
Microfilm/ Fisches	-	294
CD	11	47

Currently the library is receiving 158 journals (80 through subscription and 78 in exchange). There are 160 registered card holders using the library facilities.

Exchange Unit

Journals received on exchange basis	78
Reprints of research papers purchased	20
Reprints sent out in exchange	1932
Institutions on exchange list	62
Individuals on exchange list	169

Computer Aided Library

The library has a fully integrated multi-user LIBSYS 4 software package with addition of Web OPAC. The computerization of the literature is in progress. Most of the journals are also available on line to users.

Current Awareness Service

Current Awareness Service (CAS) has completed its 3 years. Library is continuously sending bimonthly CAS bulletin to different institutions and scientists throughout India who are interested in Palaeobotany, Earth sciences and related fields.

Lamination and Xeroxing

Lamination and xeroxing of old and rare literature are done in view of preserving the knowledge. Xeroxing facility is provided to Institute scientists as well as to out side scientists and organizations.

Facility Availed

The following Institutions/Organizations availed the library facilities:

Department of Botany, Allahabad University, Allahabad.
Department of Botany, Banaras Hindu University, Varanasi.
Department of Botany, D.A.V. College, Kanpur.
Department of Botany, Lucknow University, Lucknow.
Department of Botany, M.L.K. Degree College, Balrampur.
Department of Botany, Osmania University, Hyderabad.
Department of Geology, Aligarh Muslim University, Aligarh.
Department of Geology, Lucknow University, Lucknow.
Department of Geology, University of Jammu, Jammu.

Museum

Museum is playing an important role in popularizing palaeobotanical knowledge amongst common man. National Technology Day (May 11, 2002) and Science Day (February 28, 2003) were celebrated and Institute observed open house. Inventory (part III) of Type and Figured specimens of papers published between 1981-1990 was released during Founder's Day function (on November 14th).

Samples and specimens collected from 193 localities of the country, type and figured specimens and slides of research papers were deposited to the Museum. Technical assistance and fossil specimens were provided to the Government Museum, Chandigarh. Sets of plant fossil were sent on gift to 13 educational institutions with in the country. Students from 13 educational centers visited our Museum. Scientists from China, Canada, USA also visited the Museum besides people of our country.

Type and Figured Specimens/Slides/Negatives

The scientists of the Institute deposited specimens/ slides/negatives of their research publication as under:

Particulars	Additions during 2002-2003	Total
Type and figured specimens	34	6,219
Type and figured slides	89	12,397
Negatives of above	87	16,411

Specimens/samples were collected by the scientists from 193 localities of the country and deposited in the Museum for investigation as under:

Project No.	Specimens	Samples
Project - 1	-	34
Project - 2	812	311
Project - 3	1187	68
Project - 4	-	142
Project - 5	-	453
Project - 6	186	238
Project - 7	447	638
Project - 9	-	92
Project - 10	-	279
Project - 11	-	216
Project - 12	-	75
Project - 13	-	243
Project - 14	22	460

Samples collected other than Institute Projects - ILTP Project (107 samples), International Field Workshop (43 samples), and Special activity (7 samples).

Samples received from other organization - 31 samples from Sri V.K. Mathur, GSI (Palaeontology Division), Lucknow, and 15 samples from the Director, Project-5, GSI (Coal Wing), Kolkata.

Specimens gifted within the country to the following centers:

Birla College, Kalyan (Maharashtra).
Botanical Survey of India, Botanical Section Indian Museum, Kolkata, W.B.
Brahmanand College, Kanpur (UP).
Chandigarh Museum for Natural History, Chandigarh.
Department of Botany, Bhupal Nobles P.G. College, Udaipur (Rajasthan).
Department of Botany, Marthoma College, Chungathara.
Department of Botany, Raghubir Singh Govt., Degree College, Lalitpur (UP).
Department of Botany, V.A. Degree College, Atrauli, Aligarh (UP).
Department of Botany, Y.D.P.G. College, Lakhimpur-Kheri (UP).
Government Degree College, Harakh, Barabanki (UP).
Kuteer P.G. College, Chackke Jaunpur (UP).
M.D.P.G. College Pratapgarh (UP).
P.G. Department of Botany, Nalanda College, Biharshareif (Bihar).

Institutional Visitors

Delhi Public School, Eldeco-II, Lucknow (UP).
DIET Staff along with 104 students, Lucknow (UP).
P.G. Botany Department, Nagpur University, Nagpur (Maharashtra).
Students of Arya Vidyapith College, Gauhati University (Assam).
Students of Botany Department, Lucknow University, Lucknow (UP).
Students of Botany, Naveen Malviya Government Science College, Jabalpur (MP).
Students of Botany, Paliwal P.G. College, Shikohabad (UP).
Students of Department of Botany, D.S.N. College, Unnao (UP).
Students of Department of Botany, Gauhati University (Assam).
Students of Department of Botany, Karimgar College (Assam).
Students of Maharshi Dayanand College, Parel, University of Mumbai (Maharashtra).
Students of S.B.P.G. College, Varanasi (UP).
Teachers (of various Degree Colleges of UP) of Refresher Course Lucknow University, Lucknow (UP).

Herbarium

The Herbarium has added 1200 plant specimens, 10 wood blocks, 300 samples of polleniferous materials and 260 samples of fruits and seeds from south Shahdol Forest Division (MP). All these plant materials were processed, identified, registered and incorporated in their respective sections. About 40 museum specimens of herbal medicine were also collected from different tribal localities. All these specimens are displayed in show cases along with photographs of plants and tribal medicine men. Work on Herbarium Database Management System in being done.

Holdings

Particulars	Addition during 2002-2003	Total
Herbarium		
Plant specimens	1200	20,021
Leaf specimens	103	773
Laminated mounts of venation pattern	10	60
Xylarium		
Wood blocks	10	4,125
Wood discs	1	66
Wood cores	1,228	3,298
Wood slides	10	4,156
Palm slides (stem, leaf, petiole, root.)	-	3,195
Sporothek		
Polleniferous materials	300	2,590
Pollen slides	25	12,214
Carpothek		
Fruits & seeds	260	4,121

Herbarium facilities provided to:

Sri Vinod Kumar, Department of Botany, D.A.V. College, Kanpur.
Sri V.P. Singh, Department of Botany, T.D. College, Jaunpur.
Sri Debjyoti Bhattacharya and Miss Dipanwita Banik, Central National Herbarium, B.S.I., Howrah.
Sri S.K. Bokaolia, Department of Botany, Delhi University, Delhi.
Sri Pradeep Neopani, Dept. of Chemistry, Tribhuwan University, Kathamandu, Nepal.

Visitors:

Dr. N. Parthsarthy and Dr. S. Muthuramkumar, School of Ecology, Pondicherry University, Pondicherry.
Dr. B.P. Pal, Department of Botany, Pant Nagar University, Pant Nagar, Nainital.
Dr. S.N. Srivastava and Dr. A.R. Saxena, Department of Botany, D.A.V. College, Azamgarh.
Prof. Cheng-Sen Li and Dr. Yu-Fei Wang, Institute of Botany, Chinese Acadamy of Science Beijing, P.R. China.
Government Inter College, Kadaura, Jalaun.
Students of D.A.V. College, Kanpur.
Students of D.S.N. College, Unnao.
Teachers attending Refresher Course, Academic Staff College, Lucknow University,

Dried herbal medicinal plant parts collected from Shahdol, M.P.

Electronic Data Processing

Proxy, Mail, DNS and Backup Servers have been successfully upgraded with new Hardware. At present 45 Pentium computers are connected through LAN, which provides 24 hrs. Internet facility to the staff through the 64 Kbps leased line Internet connection. E-Mails accounts for more scientists have been opened through Institute Mail Server using Institute Domain name (BSIP.RES.IN).

This year, procured 12 new Pentium-IV systems with all peripherals, like UPS and printer and 5 Iomega zip drive, one 2400 dpi colour scanner (model HP 7450), and two 1200 dpi colour scanner (Model HP 3570/ 3500). Command anti-virus software for Windows NT server version as well as for 95/98 standalone machines have also been purchased and installed on all the Pentium machines, which protect the valuable data from viruses.

With the help of the new coloured scanner, scanning and modification of figures, maps, charts etc. has been done for the scientific publications and presentations with better quality production. Slides for the presentation of lectures in several seminar, conferences and workshop are also prepared and Multimedia presentations are also performed successfully. Recently procured Tally Accounting Software is used for the data processing and generating reports in the Account Section. Payroll and Pension packages are also modified as per the requirements and also the annual account, budget and revised estimates. Besides, the section has provided the technical support to the staff. Section has also organized a lecture-cum-training programme to the administrative staff on "Internet and E-Mail" on December 18, 2002.

Institute's web site (www.bsip.res.in) is being developed describing the Institute history, profile, achievements, events, current research work, available services, etc.

Section Cutting Unit

The unit is considered the backbone unit for any research scientist whose work is based on the sectional studies of fossil material. During the current year more than 300 fossil and rock samples were cut, about 200 thin slices of the samples and over 1000 slides of fossil sections were prepared as per the requirements of the scientists. In addition, a few gift samples were also cut and polished.

A number of scientists and students the Institute also saw the functioning of the unit. They were shown how thin sections and slides of the fossil material are prepared for microscopic studies.

Foundation Day and Founder's Day

On September 10, 2002 the Institute celebrated its Foundation Day. On this occasion Dr. Lalji Singh, Director, Centre for Cellular and Molecular Biology (CCMB), Hyderabad, delivered 'Sixth Jubilee Commemoration Lecture' on the topic "Science of establishing individual identity: Past, present and future".

On November 14, 2002- 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 M.S. Srinivasan, FNA, INSA Hon. Scientist, Department of Geology, Banaras Hindu University, Varanasi delivered the '32nd Birbal Sahni Memorial Lecture' on the topic "Cenozoic evolution of Ocean Gateways: Impact on global Ocean circulation and climate".

Professor Obaid Siddiqi, FRS, Tata Institute of Fundamental Research, National Centre for Biological Sciences, Bangalore delivered the '48th Sir Albert Charles Seward Memorial Lecture' entitled "Genetics and the origin of human kind".

H E Sri Vishnu Kant Shastri, Governor of Uttar Pradesh was the Chief Guest at the function. Professor Ashok Sahni, Chairman, Governing Body of the Institute presided over the function. Many guests and scientists from outside the Institute attended the function.

Professor Ashok Sahni, Chairman, Governing Body of the Institute presided over the function. On the occasion of the birth centenary year of Madam Padmashri Savitri Sahni the Institute paid respectful homage to her during the function. Dr. B.S. Venkatachala (along with his wife), former Director of the Institute, presented reminiscences about his long association with Smt.. Sahni. Dr. R.S. Tiwari also former Director along with his wife graced the occasion.

A view of Founder's Day Celebration

National Science Day

National Science Day (February 28th) was celebrated on the theme "50 years of DNA-25 years of IVF - The Blue Print of Life". An art competition on the topic 'Environment and Bird' for the children up to the class of 8th standard was held on February 23rd in which about 300 students from 30 schools participated in the event and winning students were awarded. Film and slide show were also organized.

A small Scientoon exhibition was erected in the Institute during National Science Day function. Besides, the day was also celebrated jointly with Regional Science Centre, Lucknow, where number of contests was organized for the students. General public also took keen interest in our activities. Local media gave a wide publicity to our events.

School Children taking part in the Art Competition

Distinguished Visitors

H.E. Sri Vishnu Kant Shastri, Governor of Uttar Pradesh

Dr. Avinash Chandra, DG, Directorate of Hydrocarbons, Ministry of Petroleum, New Delhi.

Professor Hans Hofmann, McGill University, Montreal, Canada.

Carl L. Jahannessen, University of Oregon, Engene, USA.

Sri M.N. Kalra, Department of Science and Technology, New Delhi.

Sri Chandra Kant, Dy. CA, Member, Department of Science and Technology, New Delhi.

Professor M. Kedves, Szeged University, Szeged, Hungary.

Professor Cheng-Sen Li and Professor Yu-Fei Wang, Institute of Botany, Chinese Academy of Sciences, Beijing, China.

Linda S. McElroy, Boston Mass, USA.

Professor V.D. Misra, Allahabad University, Allahabad.

Professor Obaid Siddiqi (& Smt.. Asiya Siddiqi), National Centre for Biological Sciences, Bangalore.

Dr. Lalji Singh, Director, Centre for Cellular and Molecular Biology, Hyderabad.

Sri Y.B. Sinha, Director (Exploration), Oil and Natural Gas Corporation Ltd., New Delhi.

Professor M.S. Srinivasan, Department of Geology, Banaras Hindu University, Varanasi.

Dr. R.S. Tiwari (& Smt.. Tiwari), Ex-Director of BSIP, Bhopal.

Dr. B.S. Venkatachala (& Smt. Venkatachala), Ex-Director of BSIP, Dehradun.

Proffesor Anshu K. Sinha apprising Institute activities to Professor Cheng-Sen Li and Professor Yu-Fei Wang, Institute of Botany, Chinese Academy of Sciences, Beijing, China.

Status of Official Language

To promote the usage of Hindi in official work, many concrete steps were taken. Institute continued to be an active member of City's Official Language Implementation Committee (Nagar Rajbhasha Karyanvayan Samiti - NARAKAS), as UNIT- 6. This year Institute got two key positions in Kendriya Sachivalaya Hindi Parishad's Nagar Samanvaya Samiti. The meetings of the Institute's Rajbhasha Karyanvayan Samiti were held as per schedule. In view of the decision of the Committee, Institute has unanimously decided to enhance the usage of Official language in various activities and to interact with other scientific laboratories in this regard.

Hindi abstracts for the volumes 50, 51 and 52(1) of the Institute journal Palaeobotanist were processed. Annual report for the year 2001-2002 was translated in Hindi. Hindi section of the News Letter June 2002 was also processed for publication.

Hindi terminology

One Hindi terminological word is regularly being displayed. These terms are also available on Institute's server.

Hindi Protsahan Yojna

For doing commendable work in Hindi, this year 2 First prizes (Rs. 1000/- each) were awarded to Drs (Ms) Jayasri Banerji and (Smt.) Archana Tripathi. Recipient of 3 Second prizes (Rs. 600/- each) were Drs S.K.M. Tripathi, (Smt.) Asha Khandelwal and Sri Ramesh Chandra. Third prizes (Rs. 300/- each) went to 5 persons- Smt Sunita Khanna, Sri D.K. Pal, Sri N. Unnikannan, Sri D.B. Kunwar and Sri D.K. Mishra. Prof. Ashok Sahni, Chairman, Governing Body of the Institute distributed these prizes on the momentous occasion of Founder's Day on November 14th.

Hindi Pakhwãrã

Hindi Pakhwara was organised in the Institute in which many functions were held from September 16-30, 2002. All staff participated in a befitting manner. The inaugural ceremony was held on September 16th, presided over by the Director. Dr. (Smt.) Shakuntala Kalra, Reader, Hindi Department, Maitri College, New Delhi and Prof A.R. Bhattacharya, Geology Department, Lucknow University graced the occasion. Dr. Kalra delivered a lecture on Rajbhasha Prabandhan, whereas Prof. Bhattacharya delivered a lecture on Scientific Hindi writing. On this occasion, a "debate" on the topic Pakistan ke prati Bhaarat ki Sahishnuta uchit hai was also held. The winners of the competition (for which Dr. Chhaya Sharma was one of the judges along with guests) were Dr. Rajni Tewari (1st), Dr. A. Rajanikanth (2nd) and Ms. Bhasha

Dubey (3rd) respectively.

On September 18th, a "Hindi Spelling Contest" was held, in which Dr. V.P. Jain, Director, Bhasha Kendra, Mahatma Gandhi Antarrashtriya Hindi Vishvavidyalaya, Lucknow and Dr. K.S. Saraswat were the judges. Dr. Mukund Sharma and Sri Syed Rashid Ali (1st), Sri Prem Prakash and Sri Sanjay Singh (2nd) and Dr. Rahul Garg and Sri D.K. Pal were the winners of this competition. On September 20th, in a "Prashna Manch Contest" six teams (of 3 persons each) named as Saptarshi 'Gautam', 'Bharadwaj,' 'Vishvamitra', 'Yamdagni', 'Vashishtha' and 'Kashyap' participated. The team 'Gautam' comprising of Dr. A.K. Ghosh, Sri Sanjay Singh and Sri S.S. Panwar were adjudged 1st. The 2nd prize went to 'Yamdagni' constituted of Dr. Rahul Garg, Sri D.K. Pal and Sri K.K. Bajpai. 'Vishvamitra' team got the 3rd prize represented by Dr. Rajni Tewari, Sri R.L. Mehra and Sri K.C. Chandola. Dr. Pavan Agrawal, Reader, Hindi Department, Lucknow University and Dr G.P. Srivastava acted as judges of this competition.
A "Hindi Elocution Contest" was held on September 23rd, in which Dr. H.S. Mishra, Reader, Hindi Department, Lucknow University and Dr. J.S. Guleria were the judges. The winners were Drs. Rakesh Saxena (1st), S.K.M. Tripathi (2nd) and Sri D.K. Pal (3rd) respectively. A short "Essay Contest" on the topic Rashtrapati ke roop mein A.P.J. Abdul Kalam was held on September 25th. The top three contestants were Dr. Chanchala Srivastava, Sri D.K. Pal and Sri T.K. Mandal respectively. Judges of this contest were Drs. G.P. Srivastava and S.K.M. Tripathi. A "Hindi Terminology Contest" was held on September 27th, in which Drs. Manoj Shukla and B.K.Misra were the judges. Sri V.K. Singh and Sri T.K. Mandal jointly shared 1st prize; 2nd prize went to Sri D.K. Pal and 3rd prize went to Sri Avanish Kumar.

The concluding function was held on September 30th. Prof. M.P. Singh, Member GB, chaired the function and Prof. (Smt.) K.D. Singh, Hindi Department, Lucknow University delivered a meaningful lecture on the topic Bhoomandalikaran ke pariprekshya mein Hindi ki bhoomika. Prof. Shail Nath Chaturvedi, Former Head, Ancient Indian History Department, Gorakhpur University was the Chief Guest, who spoke on the topic "Matribhasha mein vigyan". On the occasion of Founder's Day, Dr. R.S. Tiwari, former Director of the Institute honoured all the winners of the Hindi Pakhwãrã contests.

Miscellaneous

Biography of Prof. Birbal Sahni, FRS was translated in Hindi. Bilingual folders depicting Institute's history and museum were prepared. Various administrative forms of establishment unit were made bilingual and museum write ups, labels, hoardings, handouts, etc. were translated in Hindi. Four quarterly reports consisting the information of Hindi activities of the Institute were sent to DST, New Delhi. Two half yearly reports of Hindi activities were also sent to CDRI, Lucknow.

Reservations and Concessions

To provide adequate representation to Scheduled Castes (SC), Scheduled Tribes (ST) and Other Backward Classes (OBC) for posts meant for direct recruitment, the Institute has sincerely followed the General Reservation Orders of the Government of India as applicable to Autonomous Bodies and as amended from time to time. The Roster for reservation of SC and ST and OBC is maintained by post-based Roster as per the directives of the Government of India, Department of Personnel. The scientific posts from Scientist 'C' and onwards are exempted from the purview of the General Reservation Orders.

The Government of India orders issued from time to time for reservation in respect of blind, deaf and orthopaedically handicapped candidates were made applicable in Group "C" and Group "D" posts of the Institute.

A view of Independence Day celebrations 2003

The Staff

Scientists

(The names are in alphabetical order according to 'surnames')

Director

Professor Anshu K. Sinha (up to 14.02.2003, subjudice)

Emeritus Scientist

Dr Govindraja Rajagopalan (up to 31.07.2002)
Dr (Smt.) Chhaya Sharma (w.e.f. 01.08.2002)

Scientist 'G'

Dr (Smt.) Shaila Chandra (upto 03.12.2002)

Scientist 'F'

Dr (Ms) Jayasri Banerji (Scientist-Incharge w.e.f. 25.02.2003)
Dr Anil Chandra
Dr Kripa S. Saraswat

Scientist 'E'

Dr Krishna Ambwani
Dr Rahul Garg
Dr Jaswant S. Guleria
Dr Jagannath P. Mandal
Dr Ramesh K. Saxena
Dr Manoj Shukla
Dr Ashwini K. Srivastava
Dr Gajendra P. Srivastava
Dr (Smt.) Archana Tripathi
Dr (Ms) Vijaya

Scientist 'D'

Dr Anil Agarwal
Dr Annamraju Rajanikanth
Dr (Smt.) Usha Bajpai
Dr Samir K. Bera
Dr Amalava Bhattacharyya
Dr Brijendra N. Jana
Dr (Smt.) Neerja Jha
Dr (Smt.) Asha Khandelwal
Dr Madhav Kumar
Dr Rakesh C. Mehrotra
Dr Basant K. Misra
Dr Mulagalapalli R. Rao
Dr Chandra M. Nautiyal
Dr Mahesh Prasad
Dr Ram Awatar
Dr Dinesh C. Saini
Dr Omprakash S. Sarate
Dr Samir Sarkar
Dr Rakesh Saxena
Dr Mukund Sharma
Dr Kamal J. Singh
Dr Rama S. Singh
Dr (Smt.) Chanchala Srivastava
Dr Shyam C. Srivastava
Dr S.K.M. Tripathi
Dr Ram R. Yadav

Scientist 'C'

Dr Rupendra Babu
Dr Anant P. Bhattacharyya
Dr Supria Chakraborty
Dr Mohan S. Chauhan
Dr (Ms) Asha Gupta
Dr Khowaja Ateequzzaman
Dr Bhagwan D. Mandaokar
Dr Kindu L. Meena
Dr (Smt.) Neeru Prakash
Dr (Smt.) Vandana Prasad
Dr (Smt.) Jyotsana Rai
Dr Anupam Sharma
Dr (Smt.) Alpana Singh
Dr Bhagwan D. Singh
Dr (Smt.) Rashmi Srivastava
Dr (Smt.) Rajni Tewari
Dr Gyanendra K. Trivedi
Dr Rajeev Upadhyay

Scientist 'A'

Dr (Smt.) Anjum Farooqui
Dr Amit K. Ghosh
Dr (Smt..) Binita Phartiyal
Dr Anil K. Pokharia

Birbal Sahni Research Scholar

Sri Himanshu D. Dwivedi
Sri Bikash Gogoi
Ms Shruti Mishra
Sri Om Prakash
Ms Aradhana Singh

Sponsored Project

Dr Vandana Chowdhuri, Research Associate
Sri Jayendra Singh, Project Assistant
Sri Parminder S. Ranhotra, SRF
Smt. Anjali Trivedi, SRF
Sri Sandeep Bisaria, Lab Assistant
Dr Ratan Kar, Project Investigator
Ms Debi Dutta, JRF
Sri Jagdish Prasad, Field Assistant
Ms Bhasha Dubey, JRF
Smt. Sunita Tiwari, JRF
Ms Nisha Chandra, Research Assistant
Sri Suchit Swaroop, Research Assistant

Technical Personnel

Technical Officer 'D'

Dr B. Sekar

Technical Officer 'C'

Sri P.K. Bajpai
Smt. Indra Goel

Technical Officer 'B'

Dr (Smt.) M. Chakraborty
Smt. Asha Guleria
Sri P.S. Katiyar
Dr E.G. Khare
Sri T.K. Mandal
Sri Prem Prakash
Sri V.K. Singh
Sri Y.P. Singh

Technical Officer 'A'

Sri Madhukar Arvind
Smt. Reeta Banerjee
Smt. Sunita Khanna
Smt. Kavita Kumar
Sri Subodh Kumar
Sri R.C. Mishra
Sri Pradeep Mohan
Sri Chandra Pal
Sri V.P. Singh
Sri Avinesh K. Srivastava

Technical Assistant 'E'

Sri A.K. Ghosh
Sri R.L. Mehra
Sri V.K. Nigam
Sri V.S. Panwar
Sri Keshav Ram

Technical Assistant 'D'

Sri Syed R. Ali
Sri D.S. Bisht
Sri Shreerup Goswami
Sri D.K. Pal
Sri S. Suresh K. Pillai
Sri Dhirendra Sharma
Sri Madhavendra Singh
Sri S.K. Singh
Sri R.K. Tantua
Sri S.M. Vethanayagam

Technical Assistant 'C'

Sri Chandra Bali
Sri C.L. Verma
Sri S.R. Yadav

Technical Assistant 'B'

Sri Avanish Kumar
Sri M.S. Rana
Sri S.C. Singh
Sri Ajay K. Srivastava

Technical Assistant 'A'

Sri Pawan Kumar
Sri Saurabh Pradhan
Sri Om Prakash Yadav

Administrative Personnel

Registrar
Sri Suresh C. Bajpai

Accounts Officer
Sri R.K. Takru

Private Secretary
Smt. M. Jagath Janani

Section Officer

Sri I.J.S. Bedi
Sri R.K. Kapoor (Officiating)
Sri I.J. Mehra
Smt. V. Nirmala

Maintenance Officer
Sri R.B. Kukreti

Accountant
Sri Dhoom Singh (Officiating)

Assistant

Smt. Ruchita Bose
Smt. Usha Chandra
Sri Hari Lal
Sri Koshy Thomas (Officiating)
Smt. P. Thomas

Hindi Translator
Dr Puneet Bisaria

Stenographer

Sri Umesh Kumar
Sri M. Pillai

Upper Division Clerk

Sri Mishri Lal
Smt. Swapna Mazumdar
Sri S.S. Panwar
Sri Rameshwar Prasad (Officiating)
Smt. Shail S. Rathore
Sri K.P. Singh
Sri Gopal Singh
Sri Avinash K. Srivastava
Smt. Renu Srivastava
Sri N. Unnikannan

Lower Division Clerk

Sri Akhil Antal
Ms Chitra Chatterjee

Driver

Sri Nafees Ahmed ('III')
Sri D.K. Mishra ('II')
Sri M.M. Mishra ('II')
Sri V.P. Singh ('II')
Sri P.K. Mishra ('I')

Attendant 'IV' (Technical)

Sri K.C. Chandola

Attendant 'III'

Sri Prem Chandra
Sri Ram Deen
Sri Ram Kishan
Sri Sunder Lal
Sri Haradhan Mohanti
Sri Kesho Ram

Sri Ram Singh

Attendant 'II'

Smt. Maya Devi
Smt. Munni
Sri Kailash Nath
Sri Mani Lal Pal
Sri Sri Ram
Sri Bam Singh
Sri Mohammad Shakil
Sri Kedar Nath Yadav

Attendant 'I'

Sri R.K. Awasthi
Sri K.K. Bajpai
Smt. Beena
Sri Ram Dheeraj
Sri V.S. Gaikwad
Smt. Ram Kali
Sri Deepak Kumar
Sri Hari Kishan
Sri Inder Kumar
Sri Ramesh Kumar
Sri Dhan Bahadur Kunwar
Sri Subhash C. Mishra
Miss Nandani
Sri Ram Ujagar

Mali

Sri Rameshwar Prasad Pal ('III')
Sri Ram Chander ('I')
Sri Ram Kewal ('I')
Sri Mathura Prasad ('I')

Institute Cricket Team participated in the Nayudamma Memorial Cricket Tournament held under the auspices of CSIR Sports Promotion Board held during 18th-20th

Appointments and Promotions

Appointments

Dr Chhaya Sharma, Emeritus Scientist w.e.f. 01.08.2002.

Sri R.K. Takru, Accounts Officer w.e.f. 31.05. 2002.

Sri Y.P. Singh, Technical Officer 'B' w.e.f. 06.06.2002.

Sri Subodh Kumar, Technical Officer 'A' w.e.f. 26.06.2002.

Dr Puneet Bisaria, Hindi Translator w.e.f. 21.05.2002.

Sri M. Pillai, Stenographer w.e.f. 29.10.2002.

Sri Umesh Kumar, Stenographer w.e.f. 22.11.2002 (Temporary, for a period of one year only)

Miss Aradhana Singh, Birbal Sahni Research Scholar w.e.f. 11.10.2002 (at the Department of Geology, Lucknow University, Lucknow).

Sri Himanshu Dhar Dwivedi, Birbal Sahni Research Scholar w.e.f. 18.10.2002 (at the PG Department of Botany, MLK College, Balrampur).

Km. Shruti Mishra, Birbal Sahni Research Scholar w.e.f. 22.10.2002 (at the Department of Botany, Allahabad University, Allahabad).

Sri Om Prakash, Birbal Sahni Research Scholar w.e.f. 22.10.2002 (at the Department of Earth Sciences, Kurukshetra University).

Sri Bikash Gogoi, Birbal Sahni Research Scholar w.e.f. 20.10.2002 (at the Department of Applied Geology, Dibrugarh University, Dibrugarh).

Km. Nisha Chandra, Research Assistant (Sponsored Project) w.e.f. 06.09.2002.

Sri Suchit Swaroop, Research Assistant (Sponsored Project) w.e.f. 07.09.2002.

Dr (Smt.) Navita Budhraja, Research Associate w.e.f. 25.10.2002 (Co-terminus with Dr. Chhaya Sharma's tenure).

Smt. Anjali Trivedi, Senior Research Fellow w.e.f. 04.12.2002.

Sri P.S. Ranhotra, Senior Research Fellow (Sponsored Project) w.e.f. 01.01.2003.

Promotions

Dr (Smt.) Shaila Chandra, Scientist 'G' w.e.f. 01.04.2001.

Sri I.J.S. Bedi, Section Officer w.e.f. 21.06.2002.

Smt. V. Nirmala, Section Officer w.e.f. 03.12.2002.

Sri R.K. Kapoor, Accountant w.e.f. 21.06.2002, Officiating Section Officer w.e.f. 03.12.2002.

Sri Dhoom Singh, Officiating Accountant w.e.f. 09.12.2002.

Sri Hari Lal, Assistant w.e.f. 21.06.2002.

Sri Koshy Thomas, Officiating Assistant w.e.f. 28.06.2002.

Sri Avinash Kumar Srivastava, Upper Division Clerk w.e.f. 21.06.2002.

Sri Rameshwar Prasad, Officiating Upper Division Clerk w.e.f. 28.06.2002.

Sri Nafis Ahmad, Driver III w.e.f. 27.01.2003.

Sri V.P. Singh, Driver II w.e.f. 25.01.2003.

Sri M.M. Mishra, Driver II w.e.f. 02.02.2003.

Sri K.C. Chandola, Attendant IV (Technical) w.e.f. 01.04.2001.

Retirements

Dr (Smt.) Chhaya Sharma, Scientist 'F' retired on 31.07.2002.

Sri Satruhan, Attendant 'III' retired on 31.10.2002.

Sri Ramesh Chandra, Section Officer retired on 30.11.2002.

Sri N.N. Joshi, Section Officer retired on 30.11.2002.

Dr (Smt.) Shaila Chandra, Scientist 'G' retired on 31.12.2002.

Dr K. Ambwani, Scientist 'E' retired on 31.03.2003.

Resignation

Sri Sumit Kumar Manna, Technical Assistant 'D' (Library) w.e.f. 02.12.2002.

Chhaya Sharma

Satruhan

Ramesh Chandra N.N. Joshi

Shaila Chandra

K.Ambwani

Research Papers published

Agarwal A & Ambwani K 2002. *Amberiwadiacarpon devgarhensis* gen. et sp. nov. from Amberiwadi, Sindhudurg District, Maharashtra, India. Palaeobotanist 51: 107-111.

Agarwal A & Mandaokar BD 2002. A leaf impression from Early Miocene of Mizoram, India. Phytomorphology 52: 311-314.

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AUDIT REPORT
to the Governing Body of the Birbal Sahni Institute of Palaeobotany, 53 University Road, Lucknow

We have audited the attached Balance Sheet of Birbal Sahni Institute of Palaeobotany, Lucknow, as at 31st March 2003 and also the Income & Expenditure account And Receipt & Payment account for the year ended on that date annexed thereto. These financial statements are the responsibility of the Institute's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with auditing standards generally accepted in India. Those Standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statement. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

Further to our comments in the Annexure "A" attached, we report that:

(i) We have obtained all the information and explanation, which to the best of our knowledge and belief were necessary for the purpose of our audit;

(ii) In our opinion, proper books of account as required by law have been kept by the Institute so far as appears from our examination of those books;

(iii) The Balance Sheet and Income & Expenditure account And Receipt & Payment account dealt with by this report are in Agreement with the books of account;

(iv) In our opinion and to the best of our information and according to the explanations given to us, the said accounts give the information required, in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India;

a) In case of the balance Sheet, of the state of affairs of the Institute as at 31st March, 2003;

b) In the case of the Income & Expenditure account, of the surplus/deficit for the year ended on the date, and

c) In the case of Receipt & Payment account, of the receipts & payments of the Institute for the year ended on that date.

Date : 18.08.2003
Place : Lucknow

For **Singh Agarwal & Associates**
Chartered Accountants

Sd/-
Mukesh K. Agarwal
(Partner)

ANNEXURE - 'A'

Birbal Sahni Institute of Palaeobotany, Lucknow

Audit Observations made by the Chartered Accountant on the Final Accounts of the Year 2002-2003 and the Action taken by the Institute thereon

S No	Comments/Observations by the Chartered Accountants	Actions taken by the Institute
01.	The Institute is getting separate grants for Plan and Non-Plan expenses based on the budgets approved by the DST. During the year under report, the Institute has utilized Rs.20048000.00 to Non-Plan Head from Plan Head Budget with the approval of its Governing Body. It seems the DST grant does not commensurate with the requirement of the Institute under Non-Plan.	No comments.
02.	Long O/s unsettled advances (capital head) pending for recovery/ adjustment as on 31.03.2003 under different heads are to be properly taken care of at the Institute level for early adjustment. Details of which are as under	

Date	Particulars	Amount	
a)Research Apparatus & Equipment			
1996-97	M/s Darbara Singh & Sons New Delhi	1820.00	The case is in progress for the settlement of the advance.
1998-99	M/s Varina, Girdher & Co, Sky Line, Free Link and Mr M Pillai	20896.00	Out of Rs.20896/-, a sum of Rs.20142/- has been settled. Action for settlement of remaining amount of Rs.754/- is being taken.
1999-00	M/s Singapore Airlines & Girdher & Co.	2246.00	The advance has been settled.
b) Books & Journal			
1983-84	Handbook of Calcareous (Vol-7)	878.00	Handbook of Calcareous (Vol 7) is to be received.
1997-98	Alcheringa	2665.00	Alcheringa (1) has been received.
1998-99	American Jour Botany (1-6)	9414.00	American Journal Bot. (1-6) to be received during the current financial year.
2000-01	Jour Nannoplankton Research 23 & Lethaia 34 (4)	11547.00	Jour. Nannoplankton Research 23 & Lethaia 34 (4) to be received during the current financial year.
2001-02	American Jour. Botany 89(12) & Bull.British Mus.(Nat Hist) 58(2)	21813.00	American Jour. Botany 89 (12) and Bull. British Mus (Nat Hist) 58(2) has been received.
c) CNR			
02.09.97	M/s Sumit Maithy & Ashu	40000.00	These advances relate to renovation of Auditorium Block. The Institute has not taken over the renovated Auditorium Block from CPWD because of some defects still existing

	Mahajan	
02.09.97	-DO-	8300.00
20.10.99	CPWD	371100.00
05.07.99	CPWD	374100.00
12.07.99	CPWD	1722950.00
15.11.99	CPWD	159622.02
11.02.00	M/s Universal Engg. Kanpur	343808.00
31.03.00	-DO-	356949.00
03.08.00	-DO-	232656.00
10.10.00	-DO-	126342.00
13.04.02	CPWD	583648.00

in the renovated auditorium block. The Institute has written to the Authroities of CPWD at Delhi and Lucknow for removal of defects and settlement of advances. The Governing Body has directed that if the CPWD refuses to settle the advances within a time frame, a legal notice may be sent.

Action is being taken to settle the advances pending against M/s Universal Engineers, Kanpur as per the direction of the Governing Body.

03.

In addition to the above there are advances o/s since long shown in the ledger as unsettled. But these advances are not appearing in the Final Accounts of the Institute. It was informed to us during the discussion that these advances were made against the revenue expenses and have already been booked under the respective head of Expenditure. The system adopted by the Institute is against the normally accepted accounting policies. The details of such advances are as under, which are remained unsettled:

Date	**Name**	**Amount**	**Nature**
17.8.90	Nandan Khudyadi	36000/-	Centenery
24.9.91	-DO-	2000/-	DO
10.7.02	United India Insurance	4364/-	Insurance

The advances relate to field work which was carried out by Shri Nandan Khudyadi for production of a film on Prof Birbal Sahni by the DST. The matter has been taken up with the DST for the settlement of the advance.

The advance has already been settled.

As explained that this is as per accounting policy of the Institute consistently being followed since long.

No comments.

04.

During the year under audit, heavy cash withdrawals were noticed at the Institute. On discussion, it was informed that the same was done during the absence/leave period of the Director to facilitate expenditures of the Institute. As per Institute rules, approval/ratification of the Governing Body is desired.

The cash withdrawls were made as advances for the urgent/emergent expenditure for the periods when the Director was out of station and necessary settlements were made with the approval of the Director. The F&B Committee during its meeting held on 08.09.2003 has recommended that the amount of cash withdrawls be limited against realistic estimates as per the Government of India rules. This has been approved by the Governing Body on 09.09.2003.

05.

LIBRARY

The management during the year under audit carried out physical verification of the library books for the year 2000-01. As the persons deputed for the work have given the reports and discrepancies observed are yet to be complied by the section in-charge. As per the Governing Body Meeting, the physical verification of the Library is to be carried out at an

The physical verification of books and journals for the year 2000-01 has been completed and the action is being taken on the discrepancies observed in the report which are mainly for missing books and journals. The F&B Committee during its meeting held on 08.09.2003 has recommended that a list of missing books and journals be prepared and action should be taken for their write-off, if necessary, as per rules.

intervals of 02 years, so the verification is also due for the Year 2002-03.	For the physical verification of Library books and journals due for the year 2002-03, the action has been initiated.
06. **PUBLICATION**	
On scrutiny of records of the priced publication of the Institute, it has been observed that during last several years, the Institute had brought out publications on different subjects with an objective to sell out the same, in the market. The stock position of these priced publications as on 31.03.03 was Rs.36.24 Lacs apart from the reserved stock of Rs.5.89 Lacs. Thus, the total stock of the publications stood at Rs.42.13 Lacs at the close of the year, which seems to be on higher side. A practical assessment has to be made for the quantity to be got printed together with its economics etc so that wastage and blockage of funds can be avoided.	The efforts have already been made by the Institute during the year 2000 by reducing the number of copies of the journal, The Palaeobotanist from 400 to 300. The sale of the Palaeobotanist at present is approximately 150 copies and 50 copies are given in exchange programme. Approximately, 75 copies of the Palaeobotanist are given as complimentary copies. Thus, the number 300 for the Palaeobotanist is realistic. Despite Institute mounting a wide publicity for the sale of its prized publications which existed before the year 2000, the efforts have not been very successful. The F&B Committee during its meeting held on 08.09.2003 has recommended that a maximum of 50% discount may be given on bulk purchase of volumes of The Palaeobotanist issued before calender year 2000. This recommendations has been approved by the Governing Body during its meeting held on 09.09.2003. With this, stock of priced publications of the Institute may reduce substantially in coming years.
07. **STORES**	
The Fixed Assets Register and Stores Register is being maintained properly. Physical verification was to be carried out during the year under audit. As per Office Memorandum No.BSIP/ESTT.ASV/ 2000/L-262 dated 14.06.2000 nine officials of the Institute were deputed to carry out physical verification of Assets of the Institute. It has been informed to us that the job of physical verification is still continuing and will be completed soon. Apart from this the verification of some of the section is completed and the irregularities noticed are yet to be rectified/ compliance are yet to be received from the section in-charge.	Physical verification has been completed. The action is being taken in respect of irregularities noticed and will be completed within one month's time and will be shown to the auditors during the next audit.
08. The Institute, being a non-profit earning organization, no depreciation on fixed assets has been provided.	No comments.
09. **RESERVE FUND AND PENSION FUND**	
Reserve Fund & Pension Fund amounting to Rs.41.84 Lacs and Rs.84.88 Lacs do not represent investments of matching amounts. Shortfall of Rs.9.00 Lacs and Rs.22.00 Lacs respectively have not been invested as on 31.03.2003.	The amount of Rs.22.00 Lacs of the Pension Fund has since been invested in IDBI as per the recommendations of the Investment Committee of the Institute. Rs. 9.00 Lacs of the Reserve Fund has been kept in the Fixed Deposit in the Indian Overseas Bank.

10. **EMPLOYEES PROVIDENT FUND**

As against the total reserves of Rs.326.46 Lacs against the Employees Provident Fund as on 31.03.2003, a sum of Rs.43.25 Lacs was invested with Nationalised Banks and other Organisations as prescribed under the provisions of the Bye-Laws of the Institute.

No comments.

11. **OTHERS**

The Institute had given a portion of their building to Indian Overseas Bank for opening one extension counter over there during June 1997 but till date no agreement has been entered into with them and no rent, electricity charges, and other maintenance charges are being recovered.

The Indian Overseas Bank BSIP Extension Counter has been functioning since June 1997 with the approval of the F&B Committee and GB in a small Security Room. The F&B Committee during its meeting held on March 03, 2001 recommended the expansion of Security Room for Bank may be taken up when the funds were available and when the Bank occupies the expanded premises, suitable rent, electricity, water and other charges may be levied as per the agreement. The F&B Committee during its meeting held on September 08, 2003 recommended that CPWD norms may be obtained for deciding the rental charges for the bank building. This has been approved by the Governing Body during its meeting held on 09.09.2003. The direction of the Governing Body is being compiled.

Birbal Sahni Institute of Palaeobotany, Lucknow

Balance Sheet as at March 31, 2003

FORM OF FINANCIAL STATEMENTS (NON-PROFIT ORGANISATIONS)
Name of Entity : BIRBAL SAHNI INSTITUTE OF PALAEOBOTANY, LUCKNOW
BALANCE SHEET AS AT 31ST MARCH,2003

(Amount - Rs.)

CORPUS/CAPITAL FUND AND LIABILITIES	Schedule	Current Year	Previous Year
CORPUS/CAPITAL FUND	1	129073988	109234385
RESERVES ANS SURPLUS	2	4183705	3283705
EARMARKED/ENDOWMENT FUNDS	3	42030531	39823898
SECURED LOANS AND BORROWINGS	4	0	0
UNSECURED LOANS AND BORROWINGS	5	0	0
DEFERRED CREDIT LIABILITIES	6	0	0
CURRENT LIABILITIES AND PROVISIONS	7	173406	157286
TOTAL		175461630	152499274
ASSETS			
FIXED ASSETS	8	102169414	96540492
INVESTMENTS-FROM EARMARKED/ENDOWMENT FUNDS	9	38940309	39084676
INVESTMENTS-OTHERS	10	3283705	3283705
CURRENT ASSETS,LOANS,ADVANCES ETC.	11	31068202	13590401
MISCELLANEOUS EXPENDITURE (to the extent not written off or adjusted)			
TOTAL		175461630	152499274
SIGNIFICANT ACCOUNTING POLICIES	24		
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS	25		

CERTIFICATE

Certified that the figures of Assets as shown in the Balance Sheet have been reconciled with the total figure of Assets shown in the relevant Registers of the Institute.

For **Singh Agarwal & Associates**
Chartered Accountants
Sd/-
Mukesh K. Agarwal
(Partner)

Sd/-
R.K. Takru
(Accounts Officer)

Sd/-
S.C. Bajpai
(Registrar)

Sd/-
Jayasri Banerji
(Scientist-F)

Birbal Sahni Institute of Palaeobotany, Lucknow

Income and Expenditure Account for the year ending March 31, 2003

FORM OF FINANCIAL STATEMENTS (NON-PROFIT ORGANISATIONS)
Name of Entity BIRBAL SAHNI INSTITUTE OF PALAEOBOTANY,LUCKNOW
INCOME AND EXPENDITURE ACCOUNT FOR THE PERIOD/YEAR ENDED 31.03.2003

Fig. in Rupees

INCOME	Schedule	Current Year	Previous Year
Income from Sales/Services	12	482644	201925
Grants/subsidies (OB, Deposit A/C and Transfer from Cap. Fund)	13	73000000	49850643
fees/Subscriptions	14	0	0
Income from Investments (Income on Invest. From earmarked/endow.Funds transferred to Funds)	15	62801	0
Income from Royalty,Publication etc.	16	58361	121934
Interest Earned	17	593334	121812
Other Income	18	73499	415733
Increase/(decrease)in stock of Finished goods and works-in-progress	19	0	0
TOTAL(A)		74270639	50712047
EXPENDITURE			
Establishment Expenses	20	39815194	35511803
Other Administrative Expenses etc.	21	11515842	12044383
Expenditure on Grants,Subsidies etc.	22	0	0
Interest	23	0	0
Depreciation (Net Total at the year-end-corresponding to Schedule 8)		0	0
TOTAL (B)		51331036	47556186
Balance being excess of Income over Expenditure A-B		22939603	3155861
Transfer to Special Reserve (Sepecify each)		900000	0
Transfer to/from General Reserve to Pension Fund		2200000	0
BALANCE BEING SURPLUS/DEFICIT CARRIED TO CORPUS/CAPITAL FUND		19839603	3155861
SIGNIFICANT ACCOUNTING POLICIES	24		
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS	25		

For Singh Agarwal & Associates
Chartered Accountants
Sd/-
Mukesh K. Agarwal
(Partner)

Sd/-
R.K. Takru
(Accounts Officer)

Sd/-
S.C. Bajpai
(Registrar)

Sd/-
Jayasri Banerji
(Scientist-F)

Birbal Sahni Institute of Palaeobotany

Receipts and Payments Account for the year ending March 31, 2003

Fig. in Rupees

(Ammount Rs.)

RECEIPT	Current Year	Previous Year	PAYMENTS	Current Year	Previous Year
I. Opening Balances			1. Expenses		
a) Cash in hand	88	179	a) Estabishment Expenses(Corresponding to Schedule 20)	39815194	35511803
b) Bank Balances			b) Administrative Expenses(Corresponding to Schedule 21)	11515842	12044383
i) In current accounts	227373	-2556419			
ii) In deposit accounts		0			
iii) Endowment deposits		0			
II. Grants Received			II) Payments made against funds for various projects (Name of the fund or project should be shown along with the particulars of payments made for each project)		
a) From Government of India	73000000	52500000			
b) From State Government		0			
c) From other sources(details)		0			
(Grant for capital & revenue exp. To be shown separately)		0			
d)Deposit Account		0			
III. Income on Investment from			III. Investments and deposits made		
a) Earmarked/Endow. Funds	62801	1860	a) Out of Earmarked/Endpwment funds	0	
b) Own Funds (Utilized)		0	b) Out of Own Funds (Investments-Others)		
IV. Interest Received			IV. Expenditure on Fixed Assets & Capital Work-in-Progress		
a) On Bank deposits	351144	3672	a) Purchase of Fixed Assets	5628922.00	3197367
b) Loans, Advances etc.	242190	118140	b) Expenditure on Capital Work-in-Progress		
V. Other Income (specify)			V. Refund of surplus money/ Loans		
i) Sale proceeds of Publications	58361	121934			
ii) Miscellaneous Income	73499	517241	a) To the Government of India		
iii) Sale of Services (Consultancy)	482644	201925	b) To the State Government		
			c) To other providers of funds		
VI. Ammount Borrowed		0	VI. Finance Charges (Interest)		
VII. Any other receipts (give details)	1020		VII. Other Payments (Specify)		
			i) Advances to Staff	3391242	903500
			ii) Earnest Money Refended	74500	25900
			iii) Advances to Parties	338446	
I) Recovery of Advances (	1166103	967382			
ii) Earnest Money Deposit	89600	34500	VIII.Closing Balances		
iii) FDR Matured	151000	0	a) Cash in hand	32	88
			b) Bank Balances		
			i) In current accounts	15141645	227373
			ii) In deposit accounts		
			iii) Saving account		
			iv)Endowment deposit account		
			v)Excess Expenditure		
TOTAL	75905823	51910414		75905823	51910414

For Singh Agarwal & Associates
Chartered Accountants
Sd/-
Mukesh K. Agarwal
(Partner)

Sd/-
R.K. Takru
(Accounts Officer)

Sd/-
S.C. Bajpai
(Registrar)

Sd/-
Jayasri Banerji
(Scientist-F)