ANNUAL REPORT

1985-86

BIRBAL SAHNI INSTITUTE OF PALAEOBOTANY
LUCKNOW

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CONTENTS

Introduction

Birbal Sahni Institute of Palaeobotany is devoted to fundamental as well as applied aspects of research on Palaeobotany. The research activities encompass various fields of multidisciplinary specializations in biostratigraphy, palynology, geochronology, archaeobotany and other branches of plant and earth sciences which have bearing on Palaeobotany.

The conceptual plan of research activity at the Institue was re-oriented so as to achieve effective and purposeful interaction as well as collaboration amongst various Departments of the Institute and with other organizations in the country which are engaged in related scientific pursuits. Reframing of projects streamlined the objectives and provided an opportunity for optimum utilization of resources by avoiding duplication and fixing need-based priorities. In this new scheme of work, monitoring for accountability was made effective.

The programme of work for the year 1985-86 was carried out in the 11 departments under four categories of projects, namely—Inter-Departmental (I.D.) ; Departmental (D.) ; Collaborative (C.) ; and Sponsored (S.). The inter-Departmental projects were framed to pool the expertise from participant departments in order to deal with investigations concerning thrust areas effectively. The departmental projects were concerned with specific topics. The collaborative projects were undertaken with other scientific organizations having common interest and linkages while the sponsored projects were the category of programmes funded by other agencies with specific result oriented goals to meet the R & D requirements of sponsoring agencies.

Some of the important achievements made during the year under review are as follows :

Coccoid and filamentous algal forms and spherical acritarchs have been isolated from the limestone and chert, and shale facies respectively of the Vindhyan sediments of Chitrakoot and Satna areas.

A megafloral assemblage with a basal Barakar affinity has been recorded from the Deogarh Coalfield, Bihar. Study of morphographic features of *Noeggerathiopsis* and *Gangamopteris* from Deogarh Coalfield suggests a basal Barakar affinity for the assemblage. Megafloristic analysis of the Handapa area in Mahanadi Basin demonstrates that the flora is equivalent to the flora of Upper Raniganj. A phyllothecan cone having branched sporangiophores has been identified from the Barakar Formation of Raniganj Coalfield. The megafloral assemblage from the Kamthi sediments of Handapa area has elements demonstrating Upper Raniganj affinity.

Two new non-taeniate bisaccate pollen-containing cones have been discovered from the Triassic sediments near Nidhpuri, Sidhi District, Madhya Pradesh.

The genus *Eucalyptus* supposed to be indigenous to Australia has been recorded from the Deccan Intertrappean sediments of Mandla District, Madhya Pradesh and Cuddalore Sandstone near Pondicherry. Two other Australian genera, viz., *Tristania* and *Callistemon-Melaleuca*, have also been identified in the Intertrappean beds of Mandla District. The genus *Antiaris*, a constituent of present day evergreen forest of the Western Ghats, has been found in the Namsang Bed of Deomali, Arunachal Pradesh. All these findings throw new light on the phytogeography of the Cenozoic Period.

One of the megaspores from the Permian of Zaire shows an abnormal (tetralete) mark of cytokinesis. Almost all the megaspores are biodegraded mostly due to observable bacteria.

The subsurface sediments of Rajmahal Basin identified with the Dubrajpur Formation have been found to be time transgressive as these have yielded Late Permian to Early Cretaceous palynoflora. The Permian-Triassic boundary has been effectively established on the basis of new palynological records. A complete palynological sequence from Talchir-Middle Kamthi has been identified in the Ramagundam and Chelpur areas of Godavari Graben while leiosphaerids have been found in the subsurface Talchir Formation near Kancheepuram, Palar Basin. A soft-ware pertaining to literature on Indian Gondwana palynology has been developed. Fossili ferous coal balls have been discovered from Permian sediments of Arunachal Pradesh.

The biopetrological and chemical analyses of Singrauli coals show that the coals in the western part of the Singrauli Coalfield are of better quality. The coal rank in Kedia Block of Bokaro Coalfield has been found to be higher than in the other blocks. The Jharia coals contain more liptinite and resin macerals making them more susceptible to fire in mines. The Tertiary coals from Meghalaya have been found to be better suited for hydrogenation than the Assam coals.

Palynological data has been successfully used to confirm the Palaeocene age of coals of Langrin Coalfield in Assam and to date the various depth levels in Kharsang Well—2. The behaviour of reworked spores and pollen in Rokhia Well-1 in Tripura indicates unstability and rising of land in the neighbouring region.

Dinoflagellate cyst assemblages have been recovered from index ammonoids of the Tithonian. A correspondence of dinocysts *Gonyaulacysta jurassica* and *Omatia montgomeryi* and ammonoids *Blanfordiceras* and *Virgatosphinctes* has been established for Middle Upper Tithonian Stage Nannoplankton have been recovered from gypseous shale containing phosphatic nodules.

Influence of fluvial discharge affecting depositional pattern in mud-banks of Allepy Coast is reflected in the dominance of non-arboreal over arboreal pollen. The vegeta-

tion of Tarai Bhabar in Kumaon Division is reflected in the pollen spectra, except for ubiquitous and extra-regional elements. Seeds of grapes, *Vitis vinifera*, have been found in Harappan sites at Rohira and Mahorana indicating that the Harappans in Punjab practiced viticulture.

Fission tracks in some Vindhyan glauconites from Salkhan Hills indicate an age ranging from 1,050 m.y. to 1,180 m.y. Radiocarbon dates of *Kankar* in Kanpur and Fatehpur areas indicate a rate of subsidence calculated at 1.7 meter per 1,000 years. Archaeological sites newly excavated in the Andaman Islands have been dated to 2,200 years B.P.

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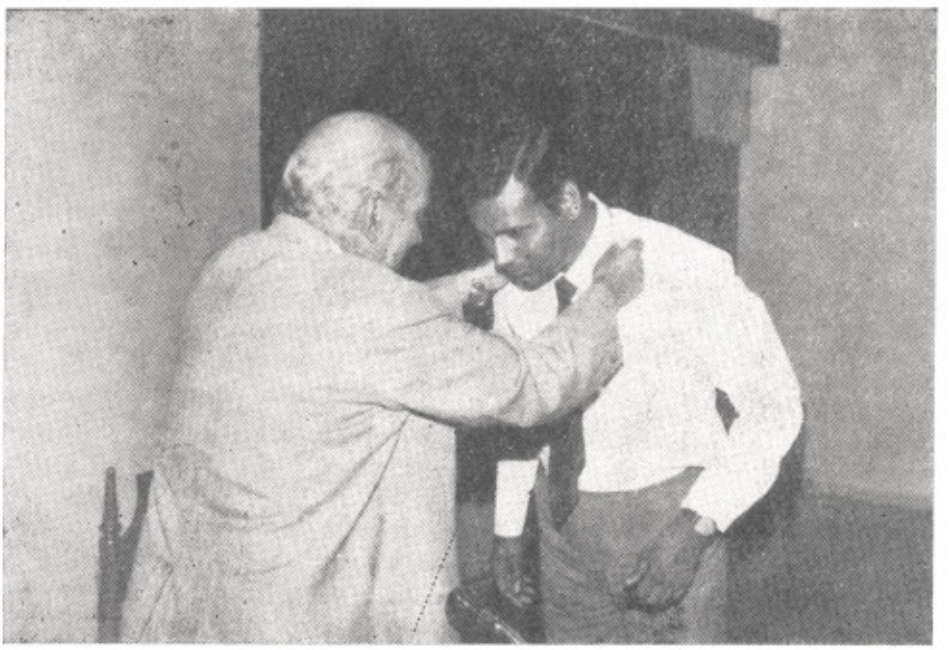
Honours and Awards

Ramesh K. Saxena .. He was awarded "Dr P. N. Srivastava Prize" of Birbal Sahni Institute of Palaeobotany.



Dr R. K. Saxena receiving the Prize from the Chief Guest.

Research

Inter-Departmental Projects

Project I.D.1. : **Floristics, stratigraphy and genesis of coals and associated Gondwana sediments in Son-Mahanadi graben**

Objective : *Floristics, phytogeography, palaeoecology, palynostratigraphy, correlation of coal seams and tracing of evolutionary trends*

Subproject I.D.1.1. : *Morphotaxonomy, floristics and biostratigraphy of Lower Gondwana plants in Son Valley*

Objective : *Comparative morphology and floristics*

Available collections from South Rewa Gondwana Basin at Institute's repository have been sorted out, identified and studied. *Glossopteris* and *Neomariopteris* have been recognised and species belonging to these two genera are listed out.

Shaila Chandra and A. K. Srivastava

Subproject I.D.1.2. : *Palynostratigraphy of the Gondwana sediments in Son Valley*

Objective : *Palynological dating and correlation of coal seams and biozonation*

Palynological analysis of the samples from Umaria-Korar region in bore-hole UKD-8(41-39 m) near Dhamokar Village in Korar Coalfield shows the abundance of: *Faunipollenites, Striatopodocarpites, Densipollenites* and *Gondisporites.* Other significant taxa are: *Microbaculispora, Microfoveolatispora, Callumispora, Lundbladispora, Nidipollenites, Satsangisaccites, Infernopollenites.* This composition suggests a Late Permian to Early Triassic age.

Samples representing Parsora Formation in the Johilla River Section and Kachcharwar area, Korar Coalfield were also processed for palynofossil investigation.

R. S. Tiwari and Ram Awatar

Subproject I.D.1.3. : *Classification of coal types, rank determination and investigation of sedimentary organic matter in the Son Valley*

Objective : *Genesis and characterization of coal types*

Biopetrological and proximate studies of coals from bore-holes NCSM-3, GMSA-111 and NCSJ-4 of Singrauli Coalfield have been finalized. Correlation of Purewa

bottom seam in the eastern part with that of the Tura Seam in the western part of the Moher sub-basin establishes time transgressive nature of coal seams from east to west. This investigation has indicated that better quality coal seams exist in the western part which may be used for blending purposes.

G. K. B. Navale and B. D. Singh

Subproject I.D.1.4. : *Floral succession in the Triassic sediments of Son Valley*

Objective : *Morphology, taxonomy and biostratigraphy*

Two new coniferous cone genera have been studied from Nidhpur (Nidpur) which contain non-striate bisaccate pollen. Reconstructions of microsporophylls have been made. The arrangement of microsporophylls is compact.

Taxonomic analyses of 12 seed genera from Nidhpuri (Nidpur) have been done and significant features that help in their reconstructions have been studied. Reconstructions are being attempted.

Shyam C. Srivastava and S. R. Manik

Project I.D.2. : **Palynostratigraphy and biodiagenesis of sedimentary deposits in East Coast basins of India**

Objective : *Floristics and identification of stratigraphically important taxa; dating and biozonation; classification and rank determination of dispersed organic matter, interpretation of palaeoenvironment, time boundaries and palaeogeography*

Subproject I.D.2.1. : *Floral succession in the Mesozoic sediments of Cauvery and Palar basins*

Objective : *Morphology, taxonomy and biostratigraphy*

Morphotaxonomic studies of plant fossils belonging to *Sphenopteris*, *Anomozamites*, *Pagiophyllum*, *Brachyphyllum* and *Araucarites* have been carried out from Cauvery Basin.

Sukh-Dev and A. Rajnikanth

Subproject I.D.2.2. : *Palynostratigraphy of Gondwana sediments of Palar Basin*

Objective : *Palynostratigraphy, dating and correlation*

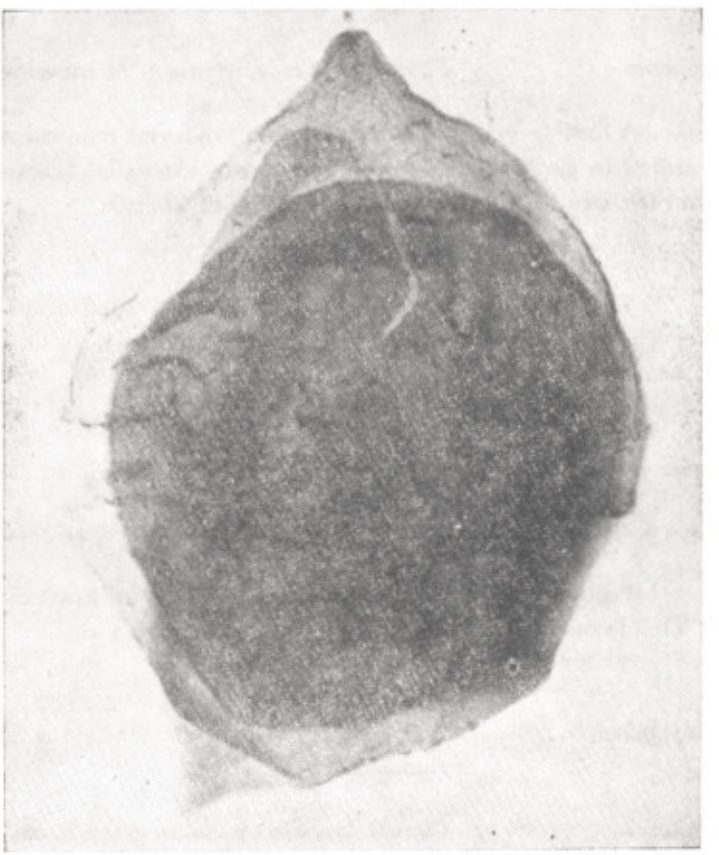
Quantitative estimation of palynofossils in the Talchir Formation in bore-holes PBK-1 and PBK-2 near Kancheepuram demonstrates abundance of monosaccate pollen. Leiosphaerids are poorly represented, yet the assemblage is comparable with the known Early Talchir palynofloras of the Peninsula. This confirms the earlier dating and environmental interpretations.

Suresh C. Srivastava

Subproject I.D.2.3. : *Phytoplankton biostratigraphy of Cretaceous-Tertiary sequences of Cauvery and Palar basins*

Objective : *Phytoplankton biostratigraphy*

A rich dinoflagellate assemblage from Upper Cretaceous sediments exposed near Tappy, Kunnam, Kullakantham and Chaitali areas in Cauvery Basin has been recovered. The occurrence of *Alterbia* from Kunnam signifies a Late Cretaceous age. Detailed morphological study of this genus demonstrates that the endoarchaeopyles, earlier believed to be of one type, are of two different shapes, viz., intercalary 2a attenuated hexa type and intercalary 2a standard hexa type respectively. Paratabulation of the genus is worked out for the first time 4′, 6″, 3a, 5‴, 2‴. Two new species of the genus have been instituted. A morphographic key has been prepared to differentiate various species of the genera *Alterbia* and *Florentinia*.



Alterbia tuberculata sp. nov. — A Lower Cretaceous dinocyst from India.

Morphotaxonomy and photodocumentation of this assemblage has been done and identified species are: *Cyclonephelium brevispinosum, C. asperum, Tanyosphaeridium*

variecalamum, Atterbia minor, Florentinia laciniata, F. deanei, F. mantelli, F. clavigera, Lejeunecysta sp. A, *Chatangiella* sp. A. and acritarch *Collumosphaera fruticosa.*

Lower Cretaceous dinocyst assemblages have been recovered from 25 samples of an exploratory bore-hole drilled at Puduvoyal, Chingleput District, Palar Basin. Documentation of the dinocyst taxa is underway. *Kleithriasphaeridium simplicispinum* and *Exochosphaeridium bifidum* are identified.

K. P. Jain and Khowaja Ateequazzaman

Samples from Uttatur Formation exposed in Karai-Kullakantham area have been processed. Calcareous nannoplankton have been recovered from two samples of gypseous shale containing phosphatic nodules.

K P. Jain and Rahul Garg

Subproject I.D.2.4. : *Tertiary megafossils of Cauvery Basin and their comparison with extant plants*

Objective : *Floristics and interpretation of palaeoenvironment and palaeogeography*

A fossil wood from the Cuddalore sandstone exposed near Pondicherry has been ascribed to *Eucalyptus*. This finding corroborates the occurrence of this Australian genus from the Deccan Intertrappean sediments of Mandla.

N. Awasthi

Thin sections of 60 pieces of carbonised woods from Neyveli lignite deposits at Neyveli have been studied. Two woods have been assigned to Sapindaceae and Anacardiaceae.

Anil Agrawal

Subproject I.D.2.5. : *Palynology of the Cuddalore Formation*

Objective : *Morphotaxonomy of spores/pollen, biozonation and correlation*

Processing of samples from shallow wells in Mayavaram and Vedaranyam areas of Thanjavur District, Tamil Nadu has been carried out.

R. K. Saxena

Subproject I.D.2.6. : *Biodiagenesis of lignite and associated sediments of Cuddalore Formation*

Objective : *Classification and correlation of lignite and associated sediments*

Palynological study of an assemblage recovered from three subsurface samples of Neyveli Lignite from Neyveli has been completed. *Neyvelicolpites, Cuddaloripollis, Arcotipollis, Bacuspinulopollenites, Fossulatricolporites, Gemmalengiopollis, Tamilipollenites, Spinotetradites* and *Tricolporotetradites* have been newly designated and circumscribed.

Forty pellets from three subsurface samples of Neyveli Lignite have been prepared. Reflectance measurements on 10 pellets have been completed. Observed reflectance value (0.36—0.42% in oil) suggests that it is a hard lignite type (hard brown coal).

G. K. B. Navale, B. K. Misra and Alpana Agarwal

Subproject I D.2.7. : *Calcareous algae from Trichinopoly, Ariyalur and Ninyur formations, Cauvery Basin*

Objective : *Morphotaxonomy*

More than 9 species of algae have been described from the sediments of Uttatur Group exposed at Olaipadi, Govindrajpet, Kallai and Kallaikudi. Six species are considered new. Holothuroid remains have also been identified. The genera *Solenopora*, *Parachaetes*, *Thaumatoporella* and *Archaeolithothamnium* are common to all the four localities.

Pramod Kumar

Project I.D.3. : **Biostratigraphy and biodiagenesis of Assam Shelf**

Objective : *Cataloguing of stratigraphically significant taxa and their vertical distribution; biozonation, time boundaries, palaeoenvironment, palaeogeography and evaluation of flora; classification and maturation levels of dispersed organic matter*

Subproject I.D.3.1. : *Tertiary vegetational history of Assam Shelf*

Objective : *Palaeoenvironment, palaeogeography and evolution of flora*

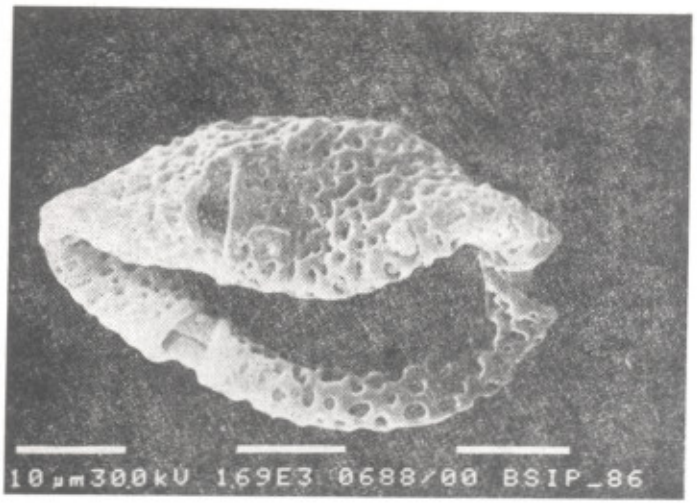
The work on fossil woods of *Bischofia* and *Antiaris* from the Namsang beds of Deomali, Arunachal Pradesh including critical remarks on fossil wood of *Bischofia* has been finalized. Occurrence of *Antiaris* in Namsang beds of Deomali is of phytogeographic significance because its closest modern equivalent is found in the evergreen forests of Western Ghats, Sri Lanka and Burma. The other species of this genus are distributed in Africa, Madagascar and Malaysia.

N. Awasthi and Uttam Prakash

Subproject I.D.3.2. : *Palynostratigraphy (spore-pollen) of the Upper Cretaceous-Palaeocene sequence in Assam Shelf*

Objective : *Palynostratigraphic zonation*

Samples from Nongwal-Bibra and Bagmara sections, Tura Formation, Meghalaya were processed and an assemblage rich in pteridophytic spores and angiospermic



Retitribrevicolporites rubra from Tura Formation showing ornamentational pattern and colporate condition.

pollen recovered. *Retitribrevicolporites rubra* has been identified.

K. Ambwani

Forty samples of Palaeocene coals of Langrin Coalfield were processed. The assemblage is dominated by the genera *Proxapertites*, *Dandotiaspora*, *Couperipollis*, *Polypodiisporites* and *Lycopodiumsporites* which indicate a Palaeocene age.

R. S. Singh

Samples from the Upper Cretaceous of Cauvery Basin were studied. The assemblage resembles the Mahadek assemblage; the genera common to both the assemblages are: *Triporoletes*, *Constantinisporites*, *Cricotriporites*, *Appendicisporites*, *Klukisporites*, *Gleicheniidites*, *Coptospora*, *Tricolpites*, *Liliacidites* and *Microfoveolatisporis*.

R. S. Singh

Systematic description of palynofossils recovered from the Kopili Formation exposed on Jowai-Badarpur Road was completed. The assemblage consists of a variety of palynofossils. Some of the important palynofossils are *Biretisporites*, *Lygodiumsporites*, *Dandotiaspora*, *Lycopodiacidites*, *Striatriletes*, *Malayaeaspora*, *Polypodiaceaesporites*, *Polypodiisporites*, *Margocolporites*, *Retitrescolpites*, *Verrutricolpites*, *Pellicieroipollis*, *Retitrescolpites*, *Ratariabrevicolporites*, *Proxapertites* and *Pinuspollenites*.

R. K. Kar and G. K. Trivedi

Spores and pollen assemblage recovered from 5 Barail coal seams of Ledo Colliery is dominated by pteridophytic spores represented by *Polypodiaceaesporites*, *Polypodiisporites* and *Pilamonoletes*, *Striatriletes*, *Dandotiaspora*, *Osmundacidites* and *Lyco-*

podiumsporites occur commonly. Common angiosperm pollen are represented by *Pilatricolporites, Tribrevicolporites, Retirtibrevicolporites, Margocolporites, Meliapollis, Pellicieroipollis, Polybrevicolporites, Trisyncolpites* and *Palaeomalvaceaepollis*. Gymnospermous pollen are a few and mostly represented by *Podocarpidites, Pinuspollenites* and *Abiespollenites*.

R. K. Kar and B. D. Mandaokar

Subproject I.D.3.3. : *Cretaceous-Tertiary phytoplankton biostratigraphy of Assam Shelf*

Objective : *Phytoplankton morphology, taxonomy and biostratigraphy, interpretation of palaeoenvironment, time boundaries and palaeogeography*

A rich assemblage of Danian dinocysts recovered from Langpar Formation exposed along Reong-Therria traverse has been studied and 125 taxa have been identified, of which the important ones are—*Deflandrea speciosa, Deflandrea* cf. *striata, Deflandrea* cf. *oceanica, Lejeunecysta hyalina, Condoniella* spp, *Cordosphaeridium inodes, Tityrosphaeridium evilimurum, Areoligera coronata, A. senonensis, Fibrocysta* cf. *bipolare* and *Palaeocystodinium* sp.

K. P. Jain and Rahul Garg

Subproject I.D.3.4. : *Biodiagenesis of Tertiary coals of Assam Shelf*

Objective : *Organic matter classification and maturation level*

Coals from Bapung, Sutunga, Jarain and Lakadong coalfields of Jaintia Hills and from West Daranggiri Coalfield of Garo Hills, Meghalaya were assessed for their microconstituents and their rank (reflectance measurements varying from 0.54 to 0.86) was determined. These coals differ from those of Assam and Nagaland in having a higher inertinite content. Relatively higher amount of hydrogen-rich microconstituents makes these coals better suitable for hydrogenation in comparison to the Assam coals. These coals have attained a rank of high volatile bituminous C-B stage. High amounts of framboidal pyrite and concretionary calcite associated with the Meghalaya coals suggest that they were deposited in shallow and back-water lagoons under the influence of alkaline milieu.

B. K. Misra

Project I.D.4 : Palaeobiology and stratigraphy of Vindhyan sediments in Son Valley and Rajasthan

Objective : *Search of Precambrian biota and tieing up of biotas with Fission Track dates of glauconite beds*

Subproject I.D.4.1. : *Palaeobiology of Vindhyan sediments and their equivalents around Son Valley and Rajasthan*

Objective : *Search for the evidence of Vindhyan life and its role in mineralization*

Observations on the microbiota and stromatolites from the Vindhyan sediments of Chitrakoot and Satna areas have been completed. The limestone and chert facies

show dominance of filamentous algal forms whereas the shales show dominance of large sized spherical acritarchs.

Stromatolites are only known from Nagod Limestone Formation in which *Baicalia* is the common form.

Limestone samples and stromatolites from the Kajrahat, Bargawan and Rohtas formations of Chopan were studied. Magascopic fossils, *Chuaria*, *Tawuia* and medusoid *Sekwia* were identified from Rohtas Formation and trace fossils were collected from the Chopan Porcellanite Formation.

Thin sections and maceration residue of the limestones from the Kajrahat Limestone Formation were studied. Biological remains are poorly represented.

P. K. Maithy, R. Babu and K. L. Meena

Subproject I.D.4.2. : *Fission track dating of glauconite deposits from the Vindhyan sediments*

Objective : *Dating and correlation of Vindhyan sediments in Son Valley and Rajasthan*

Five glauconite samples from Salkhan Hills, Son Valley have been dated as 1,050 Ma to 1,180 Ma. This corroborates with the known age data for Kheinjua Formation of Semri Group. The fission track dates for glauconite samples from Newari profile, Son Valley range from 950 Ma to 1,130 Ma. Lower Vindhyan exposures at Bullia, Jalashai, Susnai and Chopan in Son Valley were studied. Glauconite grains isolated from these samples have been sent for thermal neutron irradiation at Bhabha Atomic Research Centre, Bombay.

A. P. Srivastava and G. Rajagopalan

Departmental Projects

Project D.2.1. : **Morphotaxonomy and floristics of Lower Gondwana plants in Damodar and Rajmahal grabens and their significance in evolution and stratigraphy**

Objective : *Floristics, compilation of fossil floras, phytostratigraphy and evolution*

A new species of *Sphenophyllum*, *S. gondwanensis*, showing dimorphic leaves has been studied from Hura Tract, Rajmahal Hills. Previous records of northern species of *Sphenophyllum* in Lower Gondwana sediments have been reassessed.

V. K. Singh, A. K. Srivastava and H. K. Maheshwari

Fossil plants collected from the Lalmatia Open Cast, Hura Tract, Rajmahal Hills have been studied. The collection includes species of *Glossopteris*, *G. communis*, *G. browniana*, *G. indica*, *Glossopteris* spp., *Neomariopteris hughesii*, *Lelstotheca* sp., scale leaves, seeds and sporangia.

H. K. Maheshwari and V. K. Singh

Morphographic features of number of *Noeggerathiopsis* and *Gangamopteris* specimens from the Saharjuri outlier, Deogarh Coalfield have been studied. Cuticular studies indicate the presence of four new species. The assemblage is indicative of basal Karharbari to Barakar affinity.

Usha Bajpai

Investigation of pteridophytic remains of Sangramgarh and Dalmia collieries, Raniganj Coalfield has been completed. A phyllothecan cone showing branched sporangiophore at the nodal region of axis has been identified from the Barakar Formation. On the basis of the similarity of leaf sheaths and bract whorls it has been attributed to the genus *Phyllotheca* Brongniart.

A. K. Srivastava

Sixteen species of *Glossopteris* have been tentatively identified from the Barakar Formation of Churulia Open Cast, Raniganj Coalfield. A number of text-figures of cuticles have been made. Previous records of *Glossopteris* species have been compiled and a comparative chart prepared. Patterns of speciation and global distribution of the genus *Glossopteris* are compiled.

H. K. Maheshwari and Rajni Tewari

A statistical analysis of the various characters of the genus *Trizygia* has been undertaken for study to ascertain their morphological variation, taxonomic position and inter-relationship of the genus. A comparative chart of venation is under preparation to show the dichotomy level, pattern and its behaviour in different leaves.

H. K. Maheshwari, Usha Bajpai and V. K. Singh

A number of fertile ferns have been investigated. Sporangia of *Dichotomopteris* have been macerated and its spores processed for Scanning Electron Microscope studies. Structural variations of different sporangia have been studied under SEM and the variation pattern in *in situ* spores has been photographed.

H. K. Maheshwari and Usha Bajpai

Project D.2.2. : Morphotaxonomy, floristics and biostratigraphy of Lower Gondwana plants in Mahanadi and Pranhita-Godavari grabens

Objective : *Floristics, compilation of fossil floras, phytogeography and evolution*

Study of *Glossopteris* from Handapa area has been completed. 41 species, including nine new species, have been described. The study indicates that the flora is equival-

ent to the Upper Raniganj-Kamthi flora. On the basis of this palaeoecological and palaeogeographical conclusions have been made.

K. J. Singh and Shaila Chandra

Study on a new genus *Surangephyllum* from Handapa area has been completed. A new fertile organ has also been found.

Shaila Chandra

Project D.2.3. : Investigation of Lower Gondwana megaspores

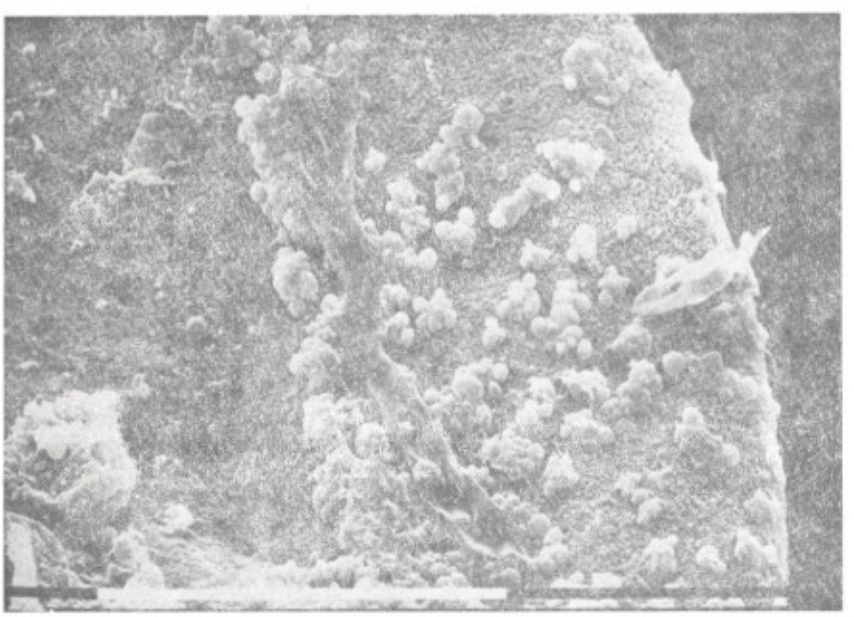
Objective : *Morphotaxonomy, affinity based on comparative studies with modern taxa and biostratigraphical significance*

Nine different type of megaspores from the Karharbari Formation have been photographed. A new type of megaspore has been subjected to differential maceration to study the internal structure.

H. K. Maheshwari and Rajni Tewari

An abnormal megaspore from the Lower Permian Coal Measures near Lake Tanga nyika, Zaire has been isolated and identified. The megaspore exhibits a tetraradiate mark of cytokinesis and its sporoderm shows biodegradation.

H. K. Maheshwari and Usha Bajpai



An infected megaspore from Lower Permian.

A plethora of sculpture patterns have been observed on the surface of sporoderm of Lower Permian megaspores from Zaire. They range from tuberculate bodies with spinose tips to doughnut-shaped bodies. Isolated and colonies of rod-shaped, ellipsoid bacteria have been found both on the surface as well as embedded in the sporoderm matrix. Some of the bacteria exhibit binary fission stages. The bacterial attack is not confined to particular loci. This investigation confirms the active role of bacteria in degradation of organic matter during biodiagenesis.

Usha Bajpai and H. K. Maheshwari

Project D.3.1. : Mesozoic flora from the Satpura Graben

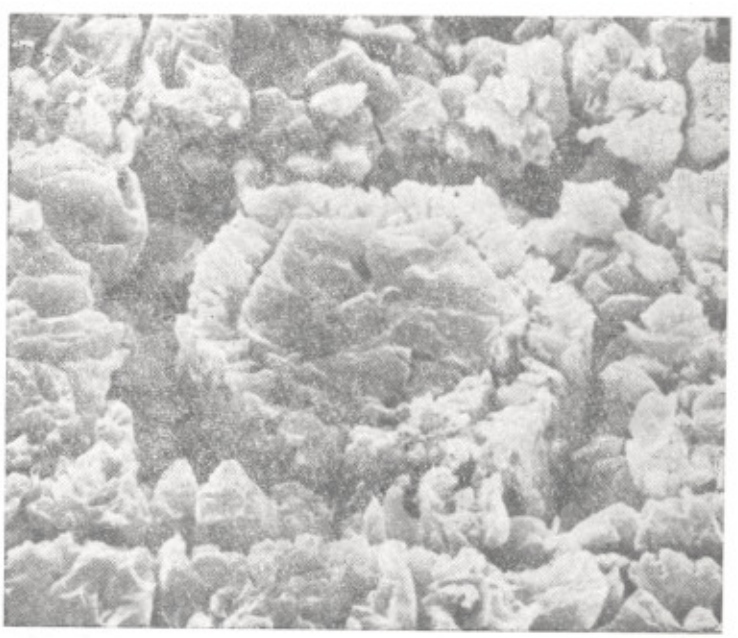
Objective : *Morphotaxonomy and relationships*

Morphotaxonomic studies on *Cladophlebis*, *Pachypteris*, *Anomozamites* and *Taeniopteris* leaves have been done. Cuticular mounts of some conifers have been prepared.

Sukh-Dev and Neeru Pandya

Project D.3.2. : Mesozoic floras from the Mahanadi and Pranhita-Godavari grabens

Objective : *Systematic study of floral succession and biostratigraphical implications*



Scanning Electron Microscopic photograph of a hexagonal radial wall pit of *Araucarioxylon santalense*.

Morphotaxonomic investigations of plant fossils: *Cladophlebis*, *Pachypteris*, *Ptilophyllum*, *Dictyozamites*, *Pagiophyllum*, *Brachyphyllum*, *Elatocladus*, *Araucarites*, *Allocladus* and fossil woods belonging to Araucariaceae, Podocarpaceae, Cupressaceae and Taxaceae from Gangapur and Kota formations were carried out using scanning and light microscopy.

Sukh-Dev and A. Rajnikanth

Two fossil woods belonging to *Araucarioxylon* and *Podocarpoxylon* from Kagaznagar area (Godepalli and Yamnapalli) have been studied.

Shyam C. Srivastava and S. R. Manik

Morphotaxonomic studies on plant fossils of pteridophytes and gymnosperms from the Athgarh Formation have been completed. The principal components of the flora are *Equisetites*, *Todites*, *Phlebopteris*, *Cladophlebis*, *Ptilophyllum*, *Brachyphyllum*, *Araucarites* and *Elatocladus*.

Sukh-Dev and Neeru Pandya

Project D.3.3. : Mesozoic floras from the Kutch Basin

Objective : *Morphotaxonomy and relationships of different groups*

Some plant remains from Bhuj Formation exposed near Trambau have been studied and fresh water environment of deposition of this bed has been postulated on the basis of the occurrence of *Trambuathallites* and *Isoetes*. Study of *Cycadospadix* and

Isoetes janainus n. sp. from Pur River Section, Kutch.

Allocladus has also been done. Some fragmentary plant remains have also been found among which *Adiantopteris* and *Stachyotaxus* are common in occurrence.

Jayasri Banerji

Project D.3.5. : Revision of Lower Cretaceous flora of India

Objective : *To prepare a monograph on the Indian Lower Cretaceous plants*

Illustrations of pteridophytic remains belonging to *Gleichenia*, *Matonidium*, *Phlebopteris*, *Hausmannia* and *Dictyophyllum* have been prepared.

Sukh-Dev

Project D.4.1. : Flora of the Deccan Intertrappean sediments

Objective : *Critical revision of the flora in view of phylogeny and evolution of angiosperms, phytogeography and ecology of Deccan Trap country*

Three new fossil woods resembling myrtaceous genera: *Eucalyptus*, *Tristania*, *Callistemon-Melaleuca* and an infructescence resembling *Callistemon-Melaleuca* have been described from the Intertrappean beds near Shahpura, Mandla District. All these genera are native to Australia. Their presence in the Deccan Intertrappean flora throws new light on the relationship of India and Australia during the Tertiary. Further study of the assemblage as well as their phytogeographical significance has been taken up.

M. B. Bande, R. C. Mehrotra and U. Prakash

A fossil wood collected from near Chabi in Mandla District has been identified as *Otonephelium* belonging to Sapindaceae.

R. C. Mehrotra

Work on a monocotyledonous infructescence *Viracarpon hexaspermum* Sahni was completed and the structure and affinities of *Viracarpon hexaspermum* Sahni have been analysed a new.

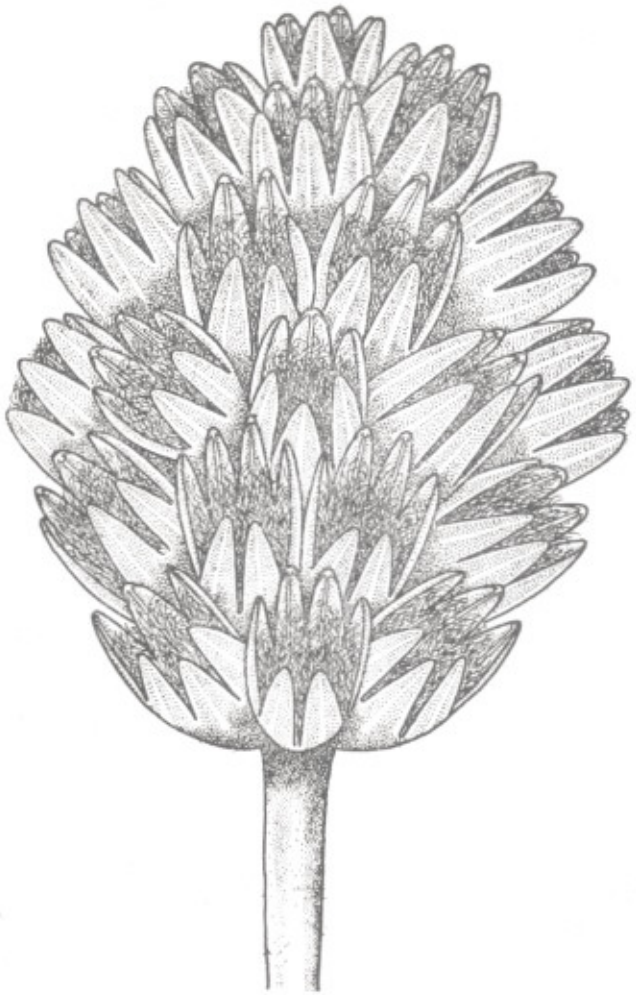
M. B. Bande and N. Awasthi

Project D.4.2. : Tertiary plant megafossils from Kerala Basin

Objective : *Morphotaxonomy, palaeoecology, phytogeography and evolution of modern tropical trees of Western Ghats*

Carbonised woods from Varkala and Payangadi have been studied. Most of them are new for the area and are tentatively assigned to the families Dipterocarpaceae, Sterculiaceae, Anacardiaceae, Leguminosae and Euphorbiaceae.

N. Awasthi and Rashmi Srivastava



Reconstruction of complete infructescence of *Viracarpon hexaspermum* Sahni as proposed by Bande and Awasthi.

Project D.4.3. : **Plant megafossils of the Siwalik sediments**

Objective : *Floral composition of Siwalik Group in Himachal Pradesh, Uttar Pradesh, Nepal and West Bengal; palaeoecology and phytogeography of Himalayan foot-hills during the Siwalik period*

Twentyfive leaf-impressions and eight fossil woods from the Lower Siwalik beds of Koilabas, Nepal and Kalagarh, Uttar Pradesh have been described. Studies on some more leaf impressions from the Lower Siwalik beds of Koilabas have been completed.

Mahesh Prasad

Project D.4.4. : Studies on Tertiary plants from Jaisalmer and Cambay basins

Objective : *To build up the vegetational history of this region during the Tertiary period*

Fifty fossil woods from the Shumar Formation near Jaisalmer were studied and identified with the extant genera *Dipterocarpus, Afzelia-Intsia, Cynometra, Millettia-Pongamia, Terminalia* and *Podocarpus*. These genera are typical of Neogene sediments. The Shumar Formation, till now considered as sub-recent due to lack of palaeontological evidence, is now dated as Neogene. A fossil wood resembling *Duabanga* of Sonneratiaceae has been studied from the Tertiary sediments near Surat implying a mangrove environment.

J. S. Guleria

Project D.4.5. : Floristics of Neogene sediments in Bihar and Bengal

Objective : *To work out vegetational history of the Neogene period in Bihar and Bengal*

Seventy leaf impressions and three new fossil woods have been studied from Palamau District, Bihar. Some of the significant taxa are : *Mangifera, Butea, Mitragyna, Flemingia, Lagerstroemia, Sterculia* and *Baileospermum.*

G. P. Srivastava

Project D.4.6. : Studies on plant fossils from Siwalik sediments around Jawalamukhi-Ranital, Himachal Pradesh

Objective : *Morphotaxonomy, palaeoecology and phytogeography*

Studies on fossil leaves of *Dipterocarpus* from Balugoloa were completed.

R. N. Lakhanpal and J. S. Guleria

Remains of Bamboo from the Lower Siwalik beds near Ranital, Himachal Pradesh have been studied.

R. N. Lakhanpal and N. Awasthi

Leaf-impresssions from the Lower Siwalik beds near Tanakpur are being studied.

N. Awasthi

Leaf-impressions from the Lower Siwalik sequence of sediments of Oodlabari near Siliguri were studied and some have been identified with the tropical genera *Mallotus, Calophyllum, Alstonia, Dillenia, Ficus* and *Shorea*.

J. S. Antal

Leaf-impressions collected from Mahendra Raj Marg, Surai Khola, Nepal are under study. Some of the taxa identified are : *Dipterocarpus*, *Bauhinia*, *Ormosia* and *Syzigium*.

N. Awasthi and Mahesh Prasad

Project D.5.1. : Early Quaternary history of floristic evolution in the Kashmir Valley

Objective : *To study the palaeobiogeography of Quaternary period through palynology and to interpret palaeoenvironment governing the development of vegetation*

Acquainted with pollen morphology of representative plants in the Kashmir vegetation.

R. R. Yadav

Palynological studies of Karewa sediments from Wapjan and Ningle Nullah have been finalized.

Palynological study of the Karewa sediments (Lower to Upper) from Wapjan shows that the non-arboreals belonging to Poaceae and Chenopodiaceae predominate the assemblage. *Artemisia* and taxa of Rosaceae are co-dominant. The other non-arboreal taxa belong to Caryophyllaceae, Asteraceae and Apiaceae. The arboreal vegetation is represented by *Pinus wallichiana*, *Quercus*, *Rhus*, *Juniperus* and *Ulmus*. The Wapjan pattern of vegetation is essentially similar to the alpine scrub vegetation suggesting cold and dry climate.

Palynological study of the Karewa sediments (Lower to Middle) from Ningle Nullah shows that the arboreal vegetation is predominated by *Juniperus*, *Picea*, *Abies*, *Quercus* and *Populus*. The non-arboreals are relatively low excepting Cyperaceae which has high values in upper lignitic samples. The aquatics such as *Nymphaea* and *Potamogeton* are found in abundance. Ferns also occur in abundance indicating high precipitation. It is inferred from the pollen spectra that the vegetation might have enjoyed temperate and humid climate.

H. P. Gupta and Chhaya Sharma

Project D.5.2. : History of vegetation and climate in the subtropical, temperate and alpine belts in Himachal Pradesh and Uttar Pradesh

Objective : *Palaeofloristics and palaeoenvironment of Quaternary period in time and space through palynological studies*

Pollen analysis of a 7 m deep profile from Rewalsar, Mandi District was partly completed. The vegetational history begins with a dominance of arboreal vegetation over non-arboreal spectra. *Pinus roxburghii* maintains high values consistently. The non-arboreal vegetation shows an increasing trend and is dominated by grasses and sedges. Prominent constituents of the ground flora are *Artemisia*, *Justicia*, members of Cheno/Ams, Asteraceae and Brassicaceae. Fern spores are also well represented.

Chhaya Sharma and M. S. Chauhan

Studies on the relationship between pollen rain and vegetation of a Tarai-Bhabar in Kumaon Division reveal that pollen spectra are reflected by the vegetation except for ubiquitous and extra-regional elements, such as pine, fir, spruce, oak and alder which are drifted from elsewhere. The sal, which is an important constituent of the forest, is not adequately represented.

H. P. Gupta and R. R. Yadav

The manuscript of "Pollen flora of North-West Himalaya" was revised and updated. It deals with the pollen morphology of about 1,000 modern plant species distributed over Kashmir, Himachal Pradesh and Kumaon.

H. P. Gupta and Chhaya Sharma

Diatoms from Kua Tal (Kumaon Himalaya) have been studied and 13 diatom taxa have been described and their absolute and relative frequencies determined. The study has revealed the preponderance of pennate diatoms.

H. P. Gupta and Asha Khandelwal

Project D.5.3. : History of vegetation and climate in tropical montane forest in Kerala

Objective : *Palynological investigation to build up a complete floral succession in forest of Annamalai Hills and the Silent Valley*

A catalogue comprising the distribution of the floral elements in the Shola Forest has been prepared.

H. P. Gupta and S. K. Bera

The study of the vegetational development during 30,000 years B. P. at Colgrain (Ootacamund), Nilgiri has been finalized. It has brought out that deductions from study of surface samples do not compare with the picture emerging out of studies on profiles. The Shola Forest constituents due to inbuilt limitations are represented in very low frequencies, even in the samples collected from within the Shola Forest.

H. P. Gupta

Project D.5.4. : Depositional pattern of pollen/spores in the Arabian Sea

Objective : *Identification of beach to offshore pollen/spore depositional sequence*

Pollen analysis of 10 grab samples from the continental shelf of Mangalore to Calicut reveals that the assemblage is mostly drifted from nearby coastal vegetation. Common littoral elements recorded are *Cocos nucifera, Borassus flabellifer, Pandanus*

and *Casuarina equisetifolia*. The pollen of Rhizophoraceae, *Avicennia* and *Sonneratia* are common representatives of mangroves.

R. R. Yadav

Project D.5.5. : Studies in atmospheric airospora in relation to human and cattle allergy and diseases of crop plants

Objective : *(i) To maintain an up-to-date pollen/spore record at BSIP and to extend similar studies in environ of Lucknow*

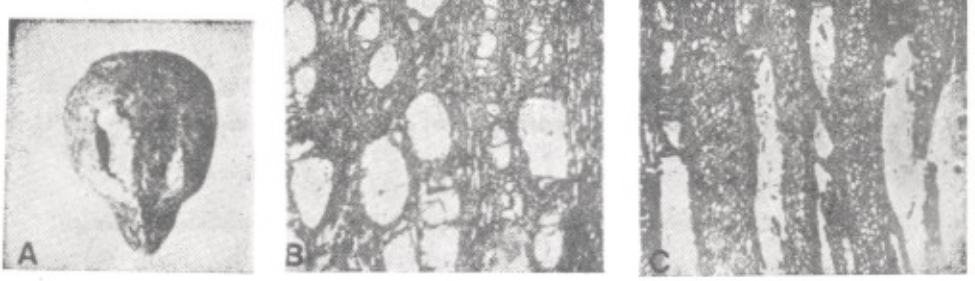
(ii) To identify bio-pollutants in air in order to work out human and cattle allergy and disease of crop plants

Annual pollen calendar (March, 1985—February, 1986) at BSIP has been completed recording 24,383 pollen grains and 17,199 fungal spores. Pollen grains of *Polygonum, Impatiens* and *Alternanthera* have been recorded for the first time. *Alnus* and *Betula* are drifted from N. W. Himalaya but are present in good frequencies as compared to the past report. The study has revealed the erratic behaviour of flowering periods of several plant taxa recorded therein.

Asha Khandelwal

Project D.5.6. : Studies in palaeoethnobotany in India: History of economic crops and other plants from pre-and proto-historic sites

Objective : *To trace palaeobotanical history of crops and other plants*



A—Grape seed; B and C, Transverse and tangential longitudinal section of Grape (*Vitis vinifera*) wood respectively.

The carbonized seeds and fruits from pre-Harappan Rohira (C.2,300-200 B.C.) have been identified as of *Hordeum vulgare* L., *Triticum sphaerococcum*, *T. dicoccum*, *Sorghum bicolor*, *Lens culinaris*, *Dolichos biflorus* and *Vitis vinifera*.

Anatomical studies of some charcoal samples revealed the presence of *Capparis aphylla*, *Tamarix aphylla*, *Acacia* sp., *Zizyphus* sp. and *Vitis vinifera*. The assemblage of grains from Harappan phase of Mahorana (C. 2,100-1,900 B.C.) consists of *Hordeum vulgare*, *H. vulgare* var. *nudum*, *Triticum sphaerococcum*, *T. compactum* and *Lens culinaris*. Three seeds of grape (*Vitis vinifera*) have further brought to light their consumption in the subsistence economy of Harappans in Punjab.

The composite evidence of grape seed and charcoal remains is suggestive that Harappans of Punjab practiced viticulture. This is the solitary evidence of grape cultivation in Harappan civilization.

K. S. Saraswat

Investigation of wood remains from different cultural horizons from Ahichchhatra, District Bareilly, U.P. (C. 1,100-800 B.C.) was completed. It brings out that locally available timbers of *Albizia* sp., *Terminalia* sp., *Dalbergia* sp. and *Shorea robusta* were exploited by the ancient settlers at this site.

Chanchala

Project D.6.1. : Palynostratigraphy of Gondwana Sequence in Rajmahal Basin

Objective : *Palynostratigraphy, biozonation and correlation of coal bearing horizons*

Morphotaxonomic analysis of palynotaxa from bore-hole RJR-2 near Kazigaon, Rajmahal region has led to circumscribe some new taxa. The study of distribution pattern of various species gives a distinct pattern of restricted distribution in the Early Triassic, Late Triassic and Late Jurassic/Early Cretaceous assemblages.

R. S. Tiwari, P. Kumar and Archana Tripathi

Quantitative determination of the palynoflora from two bore-holes – RJNE-8 (308.50 m deep) and RJNE-16 (283.10 m deep), from northern portion of the basin has been finalized. In totality the palynoflora in both the bore-holes is dominated by *Striatopodocarpites* together with *Crescentipollenites* and *Faunipollenites*; the non-striate disaccate pollen *Alisporites*, *Scheuringipollenites* and *Klausipollenites* being sub-dominant. The other significant forms are *Indospora*, *Horriditriletes*, *Microfoveolatispora*, *Marsupipollenites*, *Lundbladispora*, *Densoisporites* and *Goubinispora*. The overall composition of the assemblage is suggestive of an equivalent to the Late Raniganj. It is concluded that the strata in bore-holes RJNE-8 and RJNE-16 in between 251.50 m and 77.40 to 283.10 m depth respectively, have a Late Raniganj affinity.

Archana Tripathi

Project D.6.2. : Palynostratigraphy of Gondwana Sequence in Damodar Graben

Objective : *Palynological dating, palynostratigraphy and biozonation*

Distributional pattern of certain species of palynotaxa—*Densipollenites, Gondisporites, Lundbladispora, Densoisporites* and *Lunatisporites* has been determined in bore-core samples from eastern and western Raniganj Coalfield to delimit Permo-Triassic boundary and significant results have been obtained. The species distribution is diagnostic at this transitional phase and corroborates with the previous palynological delimitations. This study further confirms the view that Raniganj-Panchet boundary may represent the Permo-Triassic time boundary because of a major change in lithology, palynofossil frequency and extinction pattern.

Vijaya and R. S. Tiwari

Quantitative determination of the palynofossils in samples from bore-hole RAD-8 in eastern Raniganj Coalfield has revealed by presence of Raniganj-Panchet transitional palynoflora. The assemblage between 226.00 m to 502.00 m depth has a Permian (Raniganj) affinity while palynoflora in between 162.00 m to 226.00 m shows Triassic (Panchet) affinity.

Vijaya and K. L. Meena

Palynological investigation has demonstrated the presence of Raniganj/Panchet sequence underlying the basaltic flows in the subsurface in Panagarh Basin.

Vijaya

Project D.6.3. : Palynostratigraphy of Gondwana Sequence in Godavari Graben

Objective : *Palynostratigraphy, biozonation and correlation of coal bearing horizons*

Palynological succession in two bore-holes—GKG-2 and GKG-3, from Godavari-Kothagudem area and one bore-hole from Kamalpur area indicates the occurrence of Lower to Middle Kamthi Formation palynofloras for these sediments. Palynoflora of bore-hole GBR-1 (Godavari-Budharam area) and GJ-29 and GJ-30 (Godavari Chelpur area) suggests a Permian (Lower Barakar) affinity. *Kamthisaccites*—a new taeniate monosaccate pollen genus is proposed. The complete palynological sequence from Talchir to Middle Kamthi has been established in Ramagundam and Chelpur areas.

Suresh C. Srivastava and Neerja Jha

Quantitative palynological analysis of bore-hole GM-8 (455-50 m deep; Godavari-Manuguru area) shows the presence of Barakar, Barren Measures and Kamthi palynoflora.

Neerja Jha

Project D.6.4. : Palynostratigraphy of Palaeozoic and Mesozoic sediments in Mahanadi Graben

Objective : *Palynostratigraphy and biozonation*

Palynological study of certain samples available from north-eastern extension areas of Talchir Coalfield has been started.

Archana Tripathi

Attempts were made to recover palynofossils from Mesozoic sediments of Mahanadi Graben and samples from Talbasta Fire Clay mines, Orissa, but they proved to be barren.

R. S. Tiwari and B. N. Jana

Six samples collected from Sidheshwar Hills, Cuttack, Orissa contain significant palynofossils.

B. N. Jana

Project D.6.5. : Catalogue of stratigraphically significant palynofossils in the Permian, Triassic, Jurassic and Early Cretaceous sediments and to prepare data for computer

Objective : *To prepare a catalogue of stratigraphically significant taxa with morphographic circumscription and record of their distribution in time and space*

Type specimens of a few stratigraphically significant taxa, viz., *Callumispora*, *Faunipollenites*, *Crucisaccites* and *Parasaccites* together with their variability in other specimens were re-examined under light microscope for re-evaluation of morphographic characters. SEM studies were also done to get some more information. These genera have been circumscribed up to specific levels for the purpose of cataloguing.

R. S. Tiwari, S. C. Srivastava, Archana Tripathi and Vijaya

About 1,500 references on palynological literature and related scientific data on Gondwana and associated sediments of Indian continent have been coded and fed in the computer for the data storage and retrieval. This software can be utilized for the retrieval in terms of authors, basin, coalfield, locality, age, stage and various other subjects.

R. S. Tiwari, S. C. Srivastava, Archana Tripathi, B. N. Jana, Vijaya, Neerja Jha, Ram Awatar, A. P. Bhattacharyya and K. L. Meena

Project D.6.6. : Palynology of the Gondwana Sequence in Satpura Basin

Objective : *Palynostratigraphy, biozonation and correlation of coal-bearing horizons*

Correlation of coal seams in Shobhapur area of Pathakhera Coalfield has been finalized. The lowermost coal seams (Bagdona Seam) contain Upper Karharbari palynoassemblage while the younger coal contain Lower Barakar palynoassemblage.

S. C. Srivastava

Project D.7.1. : Palynostratigraphical investigation of the coal samples from D.S.D.P. LEG 218

Objective — *Palynostratigraphical studies to understand the development of Indian Ocean*

About 40 core samples of Tertiary sediments were studied. The assemblage is represented by the following taxa: *Laevigatosporites, Todisporites, Polypodisporites, Podocarpidites, Polypodiaceaesporites, Leptolepidites, Striatriletes, Contignisporites, Palmaepollenites, Polyadopollenites, Liliacidites, Pinuspollenites, Echinomonoletes, Retimonoletes, Tricolpites, Inapertisporites, Notothyrites, Phragmothyrites, Pluricellaesporites, Dicellaesporites, Utricularia, Hystrichosphaeridium, Foveofusa,* etc. The phytoplankton are poorly represented. Nine samples from the same Site-218 were also analysed to recover diatoms.

Anil Chandra

Project D.8.1. : Palynological evidence for determination of Plio-Pleistocene boundary

Objective : *Determination of boundary*

Palynological study of the Tatrot and Pinjor sediments exposed along Masol-Kiratpur Section in Ambala District, Haryana has been completed. Ten genera and 15 species have been recorded from the Tatrot Formation whereas 16 genera and 22 species have been recovered from the Pinjor Formation. Qualitative and quantitative analyses of palynofossils are being done for the demarcation of the two formations.

H. P. Singh, R. K. Saxena and M. R. Rao

Project D.8.2. : Palynostratigraphy of the Lower Tertiary sediments of Simla Hills and adjoining areas

Objective : *Biozonation, age determination and palaeo-ecological interpretation*

Systematic palynology of the Subathu Formation (Eocene) in Banethi-Bagthan area, Himachal Pradesh has been completed. Palynofossils have been referred to 59 genera and 106 species. They belong to dinoflagellate cysts, pteridophytic spores and gymnospermous and angiospermous pollen grains. Some of the important palynotaxa are—*Adnatosphaeridium vittatum, A. mulitispinosum, Cleistosphaeridium diversispinosum, Cordosphaeridium inodes, Lycopodiumsporites problematicus, Osmundacidites mollis* and *Striatriletes minor.*

Samir Sarkar and H. P. Singh

Photomicrography of palynofossils recovered from Subathu Formatiom of Dadahu-Jhamuta area in Sirmur District, Himachal Pradesh has been taken.

Asha Gupta

Project D.8.3. : Palynological study of the west coast lignites

Objective : *Morphotaxonomy of spores/pollen, biostratigraphy, correlation with Cauvery Basin lignites*

Samples from Ratnagiri beds in Ratnagiri and Sindhu Durg districts, Maharashtra have been collected. Processing of the samples for the recovery of palynofossils is underway.

R. K. Saxena

Samples of Cananore lignite and associated sediments have been collected from Payangadi, Nileshwar and Mennkunu localities. Samples are being processed for the recovery of palynofossils.

M. R. Rao

Project D.8.4. : Palynostratigraphy of Tertiary sediments of Arunachal Pradesh

Objective : *Morphotaxonomy, biozonation and correlation*

Samples representing Tertiary localities of Siang and Kameng districts of Arunachal Pradesh have been processed. Morphotaxonomic study of palynofossils is in progress and some important palynofossils referable to *Lycopodiumsporites*, *Striatriletes*, *Tricolpites*, *Dictyophyllidites*, *Palmidites* and *Collumosphaera* have been studied. These forms are distributed in the Upper Eocene sediments of Assam and Meghalaya.

S. K. M. Tripathi

Project D.9.1. : Nannoplankton morphology and biostratigraphy of Mesozoic and Tertiary sediments of Kachchh and Jaisalmer basins

Objective : *Morphotaxonomy, biozonation and time boundaries palaeoenvironment*

A rich calcareous nannoplankton assemblage from Harudi Formation and Middle Eocene age from the Baranda Ratchela Nala Section (Kachchh Basin) has been recovered. Occurrence of *Discoaster saipanensis* and *Helicosphaera compacta* is significant as these indicate nannoplankton zone NP-17 of Martini 1971—CP 14 B of Bukry, 1981. SEM photomicrographs of some nannoplankton of Harudi Formation have been taken.

S. A. Jafar and Jyotsana Rai

Project D.10.1. : Studies of dispersed organic matter from Karewa sediments

Objective : *Characterization of organic matter and study of depositional environment*

Lignite samples from two sections, viz., Nichahome and Varnar nala of Karewa lignite, Kashmir Valley have been processed for biodiagenetic studies. Slides as well

as thin sections have been made. Some sections indicate the presence of microsporangia and other cellular structures.

Anand Prakash, Rakesh Saxena and O. S. Sarate

Project D.10.3. : Critical assessment of coals from Rajmahal and Damodar grabens

Objective : *Classification of coals and assessment of their quality*

The study of coal typology, genesis and rank of West Bokaro coals shows genetical grouping of coal seams under four groups, viz., Vitric, Fusic, Intermediate vitrinite dominant and Intermediate inertinite-dominant. Rank of coal in Kedla Block is higher in comparison to that in other blocks. The abnormal behaviour of rank in lateral and vertical extent has been attributed to intrusive bodies. Another work dealing with geological and biostratigraphical studies of Permian sediments in Bokaro Basin, Bihar, India has been finalized.

G. K. B. Navale and Rakesh Saxena

Study of microconstituents from Jharia coals has indicated richness of resin and liptinite macerals in comparison to other Damodar Valley coals which suggests their suceptibility to fire in Jharia Coalfield.

Processing of Ramgarh coals has also been completed. Three pellets have been counted and photomicrography has been completed. 11 samples yielded pollen and spores.

Rakesh Saxena

Project D.10.4. : Evaluation and rank assessment of coal seams of Pathakhera Coalfield, Satpura Graben

Objective : *Coal seams characterization*

Maturation study of 30 coal samples from Pathakhera Coalfield, Satpura Basin has indicated a high volatile bituminous rank.

Anand-Prakash and O. S. Sarate

Project D.10.5. : Biodiagenetic investigation of Panandhro lignite (Kutch) and dispersed organic matter in associated sediments

Objective : *Characterization of lignite and quality assessment*

Fifty two particulate pellets of lignite and associated sediments from Panandhro Lignite Field, Kutch (Gujarat) were prepared out of which 15 were quantitatively assessed. The study indicates a high amount of Humodetrinite (Densinite) together with fair amount of calcite, pyrite, secondary iron-oxide, quartz and argillaceous mineral matters. The association suggests an alkaline milieu during deposition.

G. K. B. Navale and B. K. Mirsa

Project D.11.1. : Radiocarbron dating of carbonaceous samples

Objective : *Age determination of Quaternary sediments by C-14 method and dating of important archaeological sites*

A total of 84 samples including anthracite background and oxalic acid C-14 standard were processed.

Radiocarbon dates of 19 samples of Kankar from different depths in ground water drilling operations in Fatehpur and Kanpur indicate same amount of soil cover and contemporaneous formation of Kankar at different regions. Samples from depths greater than 50 m do not give reliable ages, probably due to contamination. The rate of subsidence is calculated at 1.7 meter per 1,000 years.

Four oceanic bottom sediment cores from different regions of Bay of Bengal have been dated. The C-14 ages of samples range from about 1,000 years to 30,000 years.

The C-14 ages of peats from West Bengal range from recent to 4,000 years B.P. The age data is being correlated with palynological assemblage to interpret past vegetational changes. New archaeological sites excavated in Andaman Islands have been dated to 2,200 years B.P.

G. Rajagopalan, B. Sekar and T. K. Mandal

Project D.11.2. : Fission Track dating of rock samples

Objective : *To date rocks and minerals by Fission track method*

Fission tracks in Apatite along the cleavage. Number of tracks is large due to high Uranium concentration (5 ppm.)

The F-T ages of the two check samples of glauconite from Paris-Basin (ODEH and EHOC obtained here) are in excellent agreement with the earlier K-Ar ages of these samples. This cross checking has clearly shown that glauconite can reliably date sedimentary deposits using F-T dating technique. The glauconite sample from Gujarat has also been processed for F-T dating. From one lot of separated glauconitic grains fossil track density has been obtained.

Two petrified wood samples had also been dated using F-T dating method, one was from Mandla District, and other was from Colorado, USA. Their F-T dates have come out as 54 $\pm$ 8 Ma and 121 $\pm$ Ma respectively.

G. Rajagopalan and A. P. Srivastava

Project D.11.3. : Potassium-Argon dating of ancient rocks

Objective : (*i*) *To establish the K-Ar dating facility*

(*ii*) *Dating of ancient rocks*

Flame photometer has been set up and procedures for potassium determination have been standardized. Potassium has been determined in a number of glauconitic sandstone samples of Lower Vindhyan deposits and trap rocks of Rajmahal.

A system was designed for the extraction and purification of gases released from the samples. The gas-extraction bottle and the crucible have also been fabricated and assembly work is in progress.

As the original analyser assembly was meant for dynamic analysis several couplings have been designed and fabricated to convert the assembly into one for static analysis.

G. Rajagopalan, C. M. Nautiyal and V. K. Singh

Birbal Sahni Research Scholar

Project : Tertiary flora of India

Cuticular studies on Neyveli lignite were completed. The cuticles belonging to genus *Litsea* of the family Lauraceae, *Shorea* of Dipterocarpaceae, *Lagerstroemia* of Lythraceae and *Cryptostegia* of Asclepiadaceae have been described in detail. Besides, a new spore genus *Aspleniumsporites* and nine new species of other pollen and spores have been reported.

A good number of fossil woods collected from Tripura were identified and described which belong to the genera *Anisopteroxylon*, *Dipterocarpoxylon*, *Lagerstroemioxylon*, *Cynometroxylon* and *Pahudioxylon*. Out of them two species are new.

These findings have been incorporated in a Ph.D. dissertation entitled "Studies on the Neogene fossil plants of Neyveli and Tripura".

Rajiv Kumar Srivastava

Project : **Stomatogenesis, spore morphology and taxonomy of cyatheoid ferns**

Objective : *Assessment of the potentialities of the properties of stomata and spores for resolving taxonomic and phylogenetic problems associated with these ferns*

Structure of spores of 105 species of cyatheoid ferns belonging to the genera—*Cyathea, Alsophila, Cnemidaria, Hemitelia, Nephelia, Sphaeropteris, Trichipteris, Cibotium, Culcita, Thyrsopteris, Metaxya, Lophosoria* and *Cystodium* has been investigated both by Scanning electron microscopy and light microscopy. Despite of their overall structural uniformity the spores of these plants are classified into twenty distinct morphological forms. The pathways of development of wall structure of all the twenty morphological forms have been traced from the tetrad condition to maturity, and the ontogenetic inter-relationships among these forms have been established for the first time. Ontogenetic studies reveal that the striated, reticulate and baculoid areolate exosporic layers are the later derivatives of the verrucate exosporic layer. The verrucate exosporic layer in its turn is developed due to elaboration in the smooth exosporic layer which quickly passes through transitional granulose and micro-verrucate stages. Smooth lamellated exospore is also a derivative of the smooth exosporic layer. Interestingly in all the genera concerned the perispore is characteristically double layered, excepting in a few species where the outer perispore is not recognizable due to reduction or ill development. The granulate, scabrate and microverrucate types of inner perisporic layer similarly evolve from an initial smooth covering. The outer perisporic layer which is a homogeneous layer, is always lumpy and granular when first deposited. It becomes folded, rugulose-striate, spinulose, spinose, hair-like or irregularly flaky due to uniform or differential dehydration.

Significantly the spores of some taxa unlike those of any other fern group, show a strong tendency towards clubbing together. Several spores originating from the same sporangium remain enveloped by a common perisporic material or are held together by perisporic threads, which are homologous to the viscin threads occurring in two angiospermic families. Incidentally this is the first ever report of the occurrence of such threads in the Filicales. Clubbing of spores facilitates intergametophytic fertilization for probable evolutionary advantages.

Formation of trilete and monolete spores alongwith intermediate forms within the same sporangium of some taxa under investigation is the first report among the cyatheoid ferns. Conclusion is made that such taxa are more evolutive than others.

Spore structure indicates that the *Cyathea* and *Dicksonia* group of genera are phylogenetically very close and that dicksonioid condition is ancestral to all other forms.

Surajit Chakraborty

Collaborative Projects

Project C.6.1. : Palynostratigraphic studies of Palaeozoic and Mesozoic sediments in western Himalaya

Objective : *Study of sporae dispersae, palynostratigraphy and dating of sediments*

Collaborating agency : *Geology Department, Lucknow University, Lucknow*

The palynofloral elements identified in the samples of Kalapani Limestone, Tethyan Sequence, Malla Johar area exhibit a close similarity with the Indian Gondwanic palynofloras. To certain extant similarity with the northern palynofloras has been observed and elements of Euro-American and Angara palynoassemblage are palaeogeographically significant.

Vijaya and R. S. Tiwari
S. Kumar, I. B. Singh (Geol. Deptt.)

Sediments from the upper part of Tal Formation exposed near Singtali on Rishikesh-Dev Prayag Road contain distinctive Late Permian-Early Triassic palynological assemblages. On the basis of this study the assignment of Precambrian age to the entire Tal sequence needs rethinking.

R. S. Tiwari
S. Kumar (Geol. Deptt.)

Project C.6.2. : Palynostratigraphic studies of Palaeozoic sediments in West-Siang District, Arunachal Pradesh

Objective : *Study of sporae dispersae and palynostratigraphy*

Collaborating agency : *Wadia Institute of Himalayan Geology, Dehradun.*

Quantitative estimation of palynofossils in Permian sediments on Garu-Gensi Road Section is continued.

S. C. Srivastava
Trilochan Singh (WIHG)

Project C.1.1. : Biological remains from Pre-cambrian Sequence of Kumaon and Garhwal Himalaya

Objective : *Evolution and diversification of early life during the Precambrian*

Collaborating agency : *Wadia Institute of Himalayan Geology, Dehradun*

Petrographic thin sections of the cherts, found as lenses and thin layers in grey dolomite below the *Kussiella-Colonnella* biostrome of Tiwari (1983) in Deoban Formation, were studied. The palaeobiological remains present were photographed and described

as *Orygmatosphaeridium, Myxococcoides, Eomycetopsis, Granomarginata, Glenobotrydion* and *Palaeolyngbya.*

Manoj Shukla
V. C. Tiwari (WIHG)

Project C.7.1. : Palynological investigation of subsurface and surface Tertiary sediments of Kerala

Objective : *To date the subsurface and surface Tertiary sediments of Kerala*

Collaborating agency : *Centre for Earth Science Studies, Trivandrum*

Samples collected from Payangadi, Minna Kunnu and other areas of Kerala were macerated and important palynological taxa photographed. These samples were collected in collaboration with the Centre of Earth Science Studies, Trivandrum.

Palmaepollenites, Couperipollis, Proxapertites, Meliapollis, Striatocolporites and *Polycolpites* were reported between the depths of 571-400 m in bore-hole core near Ambalapuzha in Alleppey District. Eocene-Oligocene planktonic foraminifera were also reported from the same depth.

Based on these finds a reinterpretation of the stratigraphy of western continental margin was suggested with the help of CESS, Trivandrum. It was postulated that rifting between India and Chagos Lakshadweep ridge was initiated with the formation of intracontinental graben type structure with the terrigenous sedimentation in the Late Mesozoic (Cretaceous) time. Transition to marine conditions slowly followed in the Early Eocene with the sinking of the basin and drifting apart till India collided with the Eurasian plate in Oligocene.

R. K. Kar
C. P. Rajendran (CESS)

Project C.9.1. : Ammonoid-dinoflagellate time resolution and correlation during Jurassic-Cretaceous in India

Objective : *To identify the stratigraphic significance of dinoflagellate cyst taxa at various Jurassic-Cretaceous stages/substages in relation to ammonites*

Collaborating agency : *Geology Department, Banaras Hindu University, Varanasi*

A preliminary draft including a brief account of dinocyst assemblages recovered from index Tithonian ammonoids and their significance in age determination and integration with ammonoid evidences has been prepared. Correspondence of dinocysts—*Gonyaulacysta jurassica* and *Omatia montgomeryi* and the ammonoids—*Blanfordiceras* and *Virgatosphinctes* during Middle Upper Tithonian stage is established.

K. P. Jain and Rahul Garg
Jaikrishna (B.H.U.)

Collaborative Inter-Departmental Projects

Project C.I.D.1. : Palynology of the Mesozoic sediments of Kutch Basin

Objective : *Palynostratigraphy, biozonation, palaeoenvironment*

Collaborating agency : *KDM Institute of Petroleum Exploration, Oil and Natural Gas Commission, Dehradun*

In the eastern Kutch, the Washtawa Formation has yielded badly preserved *Araucariacites* specimens and in this respect compares with the Jumara Formation of the mainland. The Kanthkot Formation (shale below Kanthkot Ammonite band and the Patasar shale member) has an *Araucariacites-Callialasporites* rich assemblage like that of the Jhuran Formation of the mainland. A number of samples have shown the presence of reworked Permian species, e.g. *Cannanoropollis* sp., *Plicatipollenites indicus*, *Gondwanipollenites* sp., etc.

H. K. Maheshwari and B. N. Jana

Photodocumentation and morphotaxonomy of the dinocysts from Patasar shale has been carried out.

K. P. Jain and Rahul Garg

A documented report on nannoplanktons based upon over 100 samples from about 11 sections and additional samples from various Jurassic-Cretaceous sections of Kutch Basin was submitted to the ONGC, Dehradun. Nannoplankton data indicated Late Bathonian age for a part of the Jumara Formation.

Over 500 additional samples from various Mesozoic sections have been examined for nannoplanktons.

S. A. Jafar

Project C.I.D.2. : Palynostratigraphic studies, evaluation of rank and properties of coal associated sediments in eastern Himalaya

Objective : *Palynological study of coal and associated sediments and petrographic evaluation of coals*

Collaborating agency : *Wadia Institute of Himalayan Geology, Dehradun*

Studies on the occurrence of coal balls in Gondwana sediments (Permian) of Arunachal Himalaya, India have been finalized wherein the true faunal coal balls having marine animal fossils have been reported for the first time from Indian Gondwana sediments. The study indicates that these coals are autochthonous unlike most of the peninsular Gondwana coals and were formed in shallow marginal swamps under the influence of marine conditions.

Biodiagenetic study of Gondwana coal samples from Arunachal, Darjeeling and Sikkim Himalayas indicates a dominance of inertinite group of macerals and finely disseminated mineral matter. The presence of rank fusinite establishes that the coals have been metamorphosed due to the intense Himalayan tectonic activity.

The coal and carbonaceous shale samples from Mesozoic sediments of Kutch Basin have been studied on *Magiscan* (a computerised reflectance Measurement unit) in U.S.S.R. It has been observed that the vitrinite particles of coal are slightly higher in rank than the shales. This shows that the coals are more sensitive to thermal alteration than the carbonaceous shales of the same sequence.

Anand Prakash
Trilochan Singh (WIHG)

The occurrence of fossil containing coal balls associated with Lower Permian shale and coal in Siang District is indicative of a near shore environment of deposition.

The palynoflora from sediments exposed along Passighat-Along Road sections is rich in *Callumispora* and radial monosaccate pollen suggesting an equivalent to Early Karharbari (Permian).

Morphotaxonomic study of a megaspore in transmitted and reflected light and SEM has been done.

S. C. Srivastava, Anand-Prakash and A. P. Bhattacharyya
Trilochan Singh (WIHG)

Project C.I.D.3. : Palynostratigraphy of Kharsang and Nahorkatiya wells in Assam

Objective : *Biozonation, age determination, palaeoecology and palaeogeography of these wells*

Collaborating agency : *Oil India Limited, Duliajan, Assam*

2,000 slides already prepared from Kharsang well nos. 2 and 3 Nahorkatiya well nos. 1,263, 268 were searched for palynofossils and important palynological taxa were documented and relative species frequencies determined.

On the basis of quantitative analysis two palynological zones have been proposed for both the Kharsang wells. The palynoflora in Kharsang well no. 2 can be distributed into 2 zones, the lower zone (2,800-1,700 m) is dominated by pteridophytic spores followed by gymnospermous pollen. In the upper zone (1700-510 m), the angiospermic pollen are dominant and pteridophytic spores are subdominant. *Striatriletes susannae* is found in large numbers in the upper zone.

Palynoflora recovered from Kharsang well no. 3 is dominated by the species of *Striatriletes* in the lower zone (1260—154 m); *Pediastrum* is also frequently met with. In the upper horizon (124-19 m), gymnospermous pollen are also common.

The palynofossils recovered from Nahorkatiya well no. 1 do not exhibit vertical variability. The species of *Striatriletes*, *Cyathidites*, *Polypodiaceaesporites*, *Palmaepollenites*, *Palmidies*, *Proxapertites* and *Seniasporites* are found more or less consistently throughout the depth (3,038-1,557 m). *Crassotriletes* is, however, confined in between 2,010—1,557 m and *Todisporites*, *Lygodiumsporites* and *Retitrescolpites* are recorded up to the depth of 2,990 m. Summary diagram also shows that there is no considerable change in palaeoecological condition.

In well no. NHK 268 the lower zone (3776-2678 m) is rich in phytoplankton, fungal spores and palm pollen. The upper zone (2663-2318 m) is well represented by pteridophytic spores and species of *Cyathidites*, *Striatriletes* and *Todisporites*. The summary diagram shows that marine condition was prevalent from 3776 to 2676 m after that fresh water condition was in vogue. A tropical, humid and warm climate with much of rainfall was in existence during the condition of deposition.

R. K. Kar, J. Mandal, S. Sarkar, Asha Gupta and Madhav Kumar

Project C.I.D.4. : Environmental and depositional studies in modern sediments to develop a suitable analogue to understand ancient sediments (i) Kerala mud banks

Objective : *To understand the depositional environment of mud banks*

Collaborating agency : *Centre for Earth Science Studies, Trivandrum*

Pollen analysis of seven samples from Alleppey coast has demonstrated that the littoral forest elements are represented by the pollen grains of *Cocos nucifera*, *Casuarina equisetifolia*, *Borassus flabellifer* and *Pandanus*. Amongst the mangroves, the important elements are members of Rhizophoraceae and *Avicennia*. The tropical forest elements are poorly represented. The dominance of non-arboreal pollen flora over the arboreal flora suggests the influence of fluvial discharge affecting the depositional pattern in the mudbanks.

B. S. Venkatachala, R. K. Kar and R. R. Yadav
Suchindan Nair and Ramchandran (CESS)

Project C.I.D.5. : Palynostratigraphy of Tethyan Sequence in Niti area of Kumaon Himalaya

Objective : *Palynostratigraphy, dating and correlation of Tethyan sediments*

Collaborating agency : *Geological Survey of India*

Maceration of samples from Niti area for the recovery of palynofossils is in progress.

R. S. Tiwari
V. D. Mamgain and R. S. Misra (G.S.I.)

Sponsored Projects

Project S.1.2. : **Palaeobiology, sedimentology and dating of Vindhyan around Rohtas with a bearing on mineralisation and stratigraphy**

Objective : *Stratigraphy and environments of deposition; Fission-track dating; role of biota in mineral precipitation*

Sponsoring agency : *D.S.T. Project 5(4)/83-STP III*

Systematic collections have been made from Rohtas areas exposed around Chutia, Gamharia, Baricha, Mada, Tippa, Nauhatta, Baulia, Amarkha, Akbarpur and Amjohre. A geological succession exposed in the area has been mapped and stratigraphic lithological columns prepared. Samples were collected for petrographic, heavy mineral and biotic studies.

Petrographic sections of the samples from the succession have been prepared. Heavy mineral separation of sandstone has been done. The recovery of heavy minerals is extremely poor. Thin sections and maceration of samples have been done for study of biologic remains. Biotas have been recorded from Nauhatta, Chutia, Rohtas and Bijaigarh Shale formations. Megascopic remains of life belonging to coelentrates and other problematic forms have been collected from Rohtas Formation. Observations on these forms have been completed.

The record of medusoid remain *Sekwia eccentrica* is significant. Trace fossils have been found in Amarkha Formation and Lower Kaimur Formation. Stromatolites are present in Nauhatta, Chutia and Rohtas formations. Nauhatta is characterised by *Inregnaria*. Chutia and Rohtas formations show the presence of *Stratifera* and a new form of *Cryptozoon*.

P. K. Maithy, Kedar Narain, G. Rajagopalan, Amar Sarkar and Vinod Yadav

Project S.7.1. : **Detailed palynological studies of Tipam-Surma units, Girujan Clay and Namsang Sandstone/Clay**

Objective : *Dating of Namsang/Girujan, Tipam and Surma stratigraphic units and their zonation*

Sponsoring agency : *Oil Industry Development Board, New Delhi*

Systematic description of spores and pollen recovered from Rokhia bore-hole core no. 1 drilled in Tripura was completed. The assemblage consists of 115 genera and 165 species out of which 25 genera and 34 species are attributed to reworking from Palaeozoic and Mesozoic sediments.

The assemblage is divisible into two palynological zones; the lower zone is dominated by phytoplanktons and is confined to 4,180-2,755 m and the upper zone from 230-2,670 m is dominated by angiospermic pollen followed by pteridophytes.

The summary diagram of the assemblage has also been prepared to interpret the palaeoecological condition of deposition. The marine condition prevailed at the lower depth from 4,180-3,565 m but it disappeared gradually at 675 m with the advent of low land condition, high altitudinal plants mostly represented by gymnosperms occur in the upper horizon. The reworked Palaeozoic and Mesozoic forms are minimum at lower depth but maximum in middle region indicating unstability and raising of land in the neighbouring region.

R. K. Kar

Project S.7.2. I.D.4.7. : Palynological studies of the Barail Sequence in the type area with special reference to Kopili-Barail and Barail-Surma transition

Objective : *Detailed palynological zonation and finer dating of Barail sediments*

Sponsoring agency : *Oil Industry Development Board, New Delhi*

Silchar-Half Long road section was measured with the help of ONGC Geologists and Surveyors. Six samples were collected from Upper Disang, 122 from Laisong, 44 from Jenum, 27 from Renji and 14 from Bhuban. All these samples were macerated and slides prepared which are under study.

R. K. Kar

Project S.E.1. : All India co-ordinated research project on ethnobiology

Objective : *To complete the all India inventory of wild plants used by tribals and by pre-and protohistoric man*

Sponsoring agency : *Department of Environment, Government of India*

The documentation of ethnobotanical data was continued. 2,470 index cards of 2,060 useful plant species were prepared for the Inventory. This includes data concerning 150 tribes distributed in various parts of the country. It also includes data on 60 plant species used by early man in India. From the data in hand statewise list of 350 trees and shrubs used by tribals alongwith their uses was prepared as information generated from this project for immediate translation into action of Social Forestry Programmes for the Tribal Welfare and Development.

D. C. Saini and N. K. Sharma

International Geological Correlation Programmes

IGCP Project No. 106 : *Permo-Triassic stage in geological evolution*

Further detailed study of Permo-Triassic boundary demarcation was made in Raniganj Coalfield based on the distribution of few palynofossil species.

R. S. Tiwari, Assistant Director
Member, National Working Group

IGCP Project No. 166 : *Global correlation of coal-bearing formations*

G. K. B. Navale, Assistant Director
Member, National Working Group

IGCP Project No. 196 : *Numerical calibration of the geological time scale*

Further international glauconite check samples for comparison of F-T results with K-Ar results will be taken up as and when they are obtained from the project leader.

A. P. Srivastava, Senior Scientific Assistant
Member, National Working Group

IGCP Project No. 216 : *Global biological events in earth history*

K. P. Jain, Assistant Director
Member, National Working Group

IGCP Project No. 237 : *Precambrian to Tertiary floras of the Gondwana continents*

H. K. Maheshwari, Assistant Director
Member, International Working Group

Doctorate Degree Awarded

Chanchala : For her work entitled "Wild plant remains from the archaeological sites—A palaeoecological and palaeoethnobotanical study" by the University of Lucknow.

Dr Chanchala

Madhav Kumar : For his work entitled "Palynostratigraphy of Tertiary sediments in north-east India" by the University of Kanpur.

Dr Madhav Kumar

Neerja Jha : For her work entitled "Palynology of Lower Gondwana sediments in Godavari Valley" by the University of Lucknow.

Dr Neerja Jha

O. S. Sarate : For his work entitled "Palynostratigraphical studies on some Lower Gondwana coals from Satpura Basin, M. P., India" by the University of Nagpur.

Dr O. S. Sarate

Ram Awatar : For his work entitled "Palynostratigraphic studies in Johilla Coalfield, South Rewa Gondwana Basin, Central India" by the University of Garhwal.

Dr Ram Awatar

Doctorate Theses Submitted

The following doctorate theses have been submitted.

A. P. Srivastava	:	'Fission track studies on authigenic sedimentary mineral glauconite and its application to date the Lower Vindhyan deposits'.
B. D. Singh	:	'Organic petrology and chemical studies of the coal seams of Singrauli Coalfield, Son Valley, M. P., India'.
K. J. Singh	:	'Palaeobotanical contribution to the Kamthi Formation of India'.
Nai-Zheng Du	:	'Studies on the fossil woods from the Tertiary of India, Burma and China.'

Papers Submitted

Awasthi, N. A fossil wood resembling *Xanthophyllum* from the Cuddalore Sandstone near Pondicherry. *Palaeobotanist.*

Awasthi, N. & Agrawal, A. A carbonised wood resembling *Parinari* from the Neyveli Lignite deposits, India. *Palaeobotanist.*

Awasthi, N. & Prakash, U. Fossil woods of *Kingiodendron* and *Bauhinia* from the Namsang beds of Deomali, Arunachal Pradesh. *Palaeobotanist.*

Awasthi, N. & Prakash, U. Fossil woods of *Bischofia* and *Antiaris* from the Namsang beds of Deomali, Arunachal Pradesh with critical remarks on fossil woods referred to *Bischofia*. *Palaeobotanist.*

Bajpai, Usha. *Glossopteris shailae*, a new species of fossil leaves from Upper Permian (Raniganj Formation) of India. *Palaeobotanist.*

Bajpai, Usha & Maheshwari, H. K. Bacterial degradation of fossil megaspore sporoderms. *Proc. XI int. Congr. Electron Microscopy, Kyoto.*

Bajpai, Usha & Maheshwari, H. K. On two new species of fossil woods from the Raniganj Formation, India with remarks on *Zalesskioxylon zambesiensis* from Mozambique. *Palaeobotanist.*

Bajpai, Usha & Maheshwari, H. K. SEM study of megaspore sporoderm of some Indian Selaginellas. *Phytomorphology.*

Bajpai, Usha & Singh, V. K. *Araucarioxylon kumarpurensis*, a new species of gymnospermous wood from the Upper Permian of West Bengal. *Palaeobotanist.*

Bande, M. B. Fossil wood of *Gmelina* Linn. (Verbenaceae) from the Deccan Intertrappean beds of Nawargaon with comments on the nomenclature of Tertiary fossil woods. *Palaeobotanist.*

Bande, M. B. & Awasthi, N. New thoughts on the structure and affinities of *Viracarpon hexaspermum* Sahni from the Deccan Intertrappean beds of India. *Acta Botanica.*

Bande, M. B., Mehrotra, R. C. & Prakash, U. Occurrence of Australian element in the Deccan Intertrappean flora of India. *Palaeobotanist.*

Bande, M. B. & Prakash, U. Tertiary flora of south-east Asia with remarks on its palaeoenvironment and phytogeography of the Indo Malayan region. *Rev. Palaeobot. Palynol.*

Banerji, Jayasri. Some plant remains from Bhuj Formation with remarks on the depositional environment of the beds. *Palaeobotanist.*

Banerji, Jayasri & Pal, P. K. *Allocladus papillosus* n. sp. from the Salt Range, Pakistan. *Geophytology.*

Chandra, A. & Srivastava, A. K. Miofloral studies of coal measures in South Rewa Gondwana Basin and their biostratigraphical significance. *Palaeobotanist.*

Garg, R. Remarks on the microfauna of Jurassic rocks of Jaisalmer, western Rajasthan, India. *Geosci. Journal.*

Garg, R. & Singh, S. K. *Singhamina* and *Tandonina*, new foraminiferal genera—Evidence for discorbid lineage from the Middle Jurassic of Jaisalmer, western Rajasthan, India. *J. palaeont. Soc. India.*

Guleria, J. S. Bibliography of Indian palaeobotany for the year 1981 and 1982. *Palaeobotanist.*

Gupta, H. P. & Khandelwal, Asha. Diatom analysis, Hirpur Loc. III (Lower Karewa), Kashmir Valley. *Palaeobotanist.*

Gupta, H. P. & Sharma, Chhaya. Pollen flora of north-west Himalaya: A monograph. *I.A.P. Publication.*

Gupta H. P. & Sharma, Chhaya. Pollen analysis of modern sediments from Khasi and Jaintia Hills, Meghalaya, India. *J. Palynol.*

Gupta, H. P. & Prasad, K. The vegetational development during 30,000 year B. P. at Colgrain (Ootacamund), Nilgiris, South India. *J. Palynol.*

Jain, K. P., Jana, B. N. & Maheshwari, H. K. Fossil floras of Kutch, Part VI. Jurassic dinoflagellates. *Palaeobotanist.*

Jain, K. P. & Garg, R. Revision and reassessment of a dinoflagellate cyst assemblage from Sangchamalla Formation (Upper Flysch), Malla Johar area, Kumaon Himalaya, India. *Palaeobotanist.*

Kar, R. K. & Bhattacharya, M. Palynological investigation of Rajpardi Lignite, southern Gujarat and its comparison with Gujra Dam Section cutting and Akri lignite, northern Gujarat, western India. *Palaeobotanist.*

Kar, R. K. & Kumar, M. Palaeocene palynostratigraphy of Meghalaya. *Pollen Spores.*

Raha, P. K., Rajendran, C. P. & Kar, R. K. Occurrence of Eocene palynomorphs in subsurface Tertiary sediments of Kerala. *J. geol. Soc. India.*

Lakhanpal, R. N. & Guleria, J. S. Fossil leaves of *Dipterocarpus* from the Lower Siwalik beds near Jawalamukhi, Himachal Pradesh. *Palaeobotanist.*

Maheshwari, H. K. *Thinnfeldia indica* Feistmantel and associated plant fossils from Tiruchirapalli District, Tamil Nadu. *Palaeobotanist.*

Maheshwari, H. K. & Bajpai, Usha. An abnormal megaspore from Lower Permian Coal Measures near Lake Tanganyika, Zaire. *Palaeobotanist.*

Maheshwari, H. K. & Srivastava, A. K. *Lelstotheca* Maheshwari, from the Barakar Formation of Raniganj Coalfield. *Palaeobotanist.*

Maheshwari, H. K. & Tewari, Rajni. *Maheshwariella spinicornuta,* a new species of gymnospermous seed from Karharbari Formation. *Palaeobotanist.*

Maithy, P. K., Narain, K. & Sarkar, A. Body and trace fossils from the Vindhyans exposed around Rohtas, Bihar. *Curr. Sci.*

Misra, B. K., Ahmed, M. & Navale, G. K. B. Petrological, chemical and depositional aspects of eastern Himalayan coals from Elephant Flat area, Kameng District, Arunachal Pradesh, India. *int. J. Coal Geol.*

Navale, G. K. B. Definition of terms and classification system of coal resources. *Geophytology.*

Navale, G. K. B. Climatic and tectonosedimentary implications in Lower Gondwana coal formation. *Q. J. geol. Min. metall. Soc. India.*

Pant, D. D. & Singh, V. K. Xylotomy of some woods from Raniganj Formation (Permian), Raniganj Coalfield, India. *Palaeontographica.*

Prakash, U., Bande, M. B. & Lalitha, V. Genus *Phyllanthus* from the Tertiary of India with critical remarks on the nomenclature of fossil woods of Euphorbiaceae. *Palaeobotanist.*

Saraswat, K. S. Plant economy in ancient Rohira, Period IB, Punjab (C.2,000-1,700 B.C.). *Palaeobotanist.*

Sarate, O. S. Palynological corrrelation of the coal seams of Pathakhera Coalfield, M. P., India. *Geophytology.*

Srivastava, Suresh C. & Sarate, O.S. Palynostratigraphy of Lower Gondwana sediments. from Shobhapur Block, Pathakhera Coalfield, M. P., India. *Palaeobotanist.*

Singh, V. K., Srivastava, A. K. & Maheshwari, H. K. Sphenopsids from the Barakar Formation of Hura Tract, Rajmahal Hills, Bihar. *Palaeobotanist.*

Singh, M. P., Rao, M. R. & Saxena, R. K. Palynology of the Barail (Oligocene) and Surma (Lower Miocene) sediments exposed along Sonapur-Badarpur Road Section, Jaintia Hills (Meghalaya) and Cachar (Assam). Part VII. Discussion. *Palaeobotanist.*

Srivastava, A. K. *Gondwanophyllites*, a new genus from the Raniganj Coalfield, West Bengal. *Proc. natn. Sci. Acad. India.*

Srivastava, A. K. Indian fossil flora of the Lower Gondwana System—A review. *Jl. Recent Adv. appld. Sci.*

Srivastava, A. P., Rajagopalan, G., Singh, I. B. & Kumar, S. Fission track dating of glauconite in a condensed Lower Vindhyan Sequence (middle Proterozoic) in North Central India. *Precambrian Res.*

Srivastava, A. P. & Rajagopalan, G. Glauconite: Fission track chronometer for dating sedimentary deposits. *Proceedings of the 4th Seminar/Workshop on SSNTDs.*

Srivastava, A. P. & Rajagopalan, G. F-T dating of Precambrian deposits of Vindhyan Group. *Proc. Seminar/Workshop on SSNTDs.*

Srivastava, A. P., Rajagopalan, G. & Ambwani, K. Fission track dating of fossil palm wood from Shahpura, Mandla District, M.P. *Geophytology.*

Srivastava, S. C. & Jha, Neerja. Palynostratigraphy of Lower Gondwana sediments in Ramagundam area, Godavari Valley Coalfield, Andhra Pradesh, India. *Palaeobotanist.*

Srivastava, S. C. & Jha, Neerja. A new monosaccate pollen genus from Kamathi Formation of Godavari Graben, A.P., India. *Geophytology.*

Srivastava, S. C. & Jha, Neerja. Palynology of Kamthi Formation from Chelpur area, Godavari Graben, Andhra Pradesh, India. *Palaeobotanist.*

Tiwari, R. S. & Tripathi, A. *Dubrajisporites*—A new trilete reticulate miospore genus from Late Triassic of Rajmahal Basin, India. *Alcheringa.*

Tiwari, R. S. & Ram Awatar. A palynological assemblage from Parsora Formation, Johilla Coalfield, South Rewa Gondwana Basin, Central India. *Geophytology.*

Papers Published

Ambwani, K. (1985). Observations on the stem anatomy of *Trachycarpus martiana H.* Wend. *Geophytology* **15:** 199-205.

Anand-Prakash (1985). The fossil floras of Kachchh. IV—Nature, composition and rank (maturation) of Mesozoic coals. *Palaeobotanist* **34:** 281-293.

Bajpai, Usha (1985). A Gangamopterid leaf from the Raniganj Formation. *Geophytology* **15**(1): 60-63.

Gupta, Asha (1985). *Inaperturotetradites udarii*, nom. nov.—A new name for *Inaperturotetradites psilatus* Rao & Ramanujam, 1982. *Geophytology* **15**(1): 113.

Gupta, Asha (1985). *Inapertisporites udarii* nom. nov., a correction for *Inapertisporites punctatus* Chandra, Saxena & Setty 1984. *Geophytology* **15**(2): 226.

Gupta, Asha & Udar, R. (1986). Palyno-taxonomy of selected Indian liverworts. *Bryophytorum bibliotheca* **29**: 1-202.

Jain, K. P. & Garg, Rahul (1986). Upper Palaeocene dinoflagellate cysts and acritarchs from Vriddhachalam, Cauvery Basin, southern India. *Palaeontographica* **B198:** 101-132.

Kar, R. K. (1985). The fossil floras of Kachchh-IV. Tertiary palynostratigraphy. *Palaeobotanist* **34**(1): 1-280.

Khowaja-Ateequzzman, Jain, K. P. & Manum, S. B. (1985). Dinocyst genus *Discorsia:* A reinterpretation. *Palynology* **9:** 95-103.

Navale, G. K. B. (1984). Lower Gondwana coals of India: Palaeobotany, petrology and genesis. *Comun. Serv. Portugal.* **70**(2): 245-256.

Navale, G. K. B. (1985). Some causative factors for the formation of the variable Permian coal types of India. *Proc. int. Conf. Coal. Sci.*: 585-588.

Navale, G. K. B. & Misra, B. K. (1984). Significance of vitrinite/inertinite ratio in Lower Gondwana coals of Peninsular India. *Comun. Surv. Geol. Portugal.* 1984, **70**(2): 257-263 (Symposium on Gondwana coals, Lisbon, 1983 ed. MJ. Lemos de Sousa),

Nautiyal, C. M., Paida, J. T., Rao, M. N. & Venkatesan, T. R. (1986). Solar flora, Neon composition and solar cosmic ray exposure ages based on lunar mineral separates. *Astrophys. J.* **301:** 465-470.

Prasad, B. & Maithy, P. K. (1985). Re-evaluation of some Indian Lower Gondwana Filicalean taxa. *Geophytology* **15**(2): 219-223.

Rao, M. R., Saxena, R. K. & Singh, H. P. (1985). Palynology of the Barail (Oligocene) and Surma (Lower Miocene) sediments exposed along Sonapur-Badarpur Road Section, Jaintia Hills (Meghalaya) and Cachar (Assam). Part V. Angiospermous pollen grains. *Geophytology* **15**(1): 7-23.

Saraswat, K. S. (1985). Plant economy at ancient Narhan (C. 700 B.C.-400 A.D.). *Poharati n.s.* **3:** 165-176.

Saxena, R. K. & Sarkar, S. (1986). Morphological study of *Frasnacrioptetrus* Taugourdeau emend. from Tertiary sediments of Himachal Pradesh. *Rev. Palaeobot. Palynol.* **46**(3-4): 209-225.

Sharma, Chhaya (1985). Recent pollen spectra from Garhwal Himalaya. *Geophytology* **15**(1): 87-97.

Sharma, Chhaya (1985). On the Late Quaternary vegetational history in Himachal Pradesh-3. Parasram Tal. *Geophytology* **15**(2): 206-218.

Singh, H. P. (1986). History of pteridophytic spores in India. *National Symp. biol. Indian pteridophytes*: 14.

Srivastava, A. P. & Rajagopalan, G. (1985). Fission track dating technique applied to glauconite. *Bull. Lias Inf. IGCP Proj.* 196, **5:** 42-47.

Srivastava, A. P., Rajagopalan, G. & Nagpaul, K. K. (1985). Fission track ages of Lower Vindhyan glauconitic beds at Mirzapur, U.P. *Indian J. Earth Sci.* **12**(2): 89-92.

Tiwari, R. S. & Singh, Vijaya (1985). Further observations on *Jugasporites*-complex *J. palaeont. Soc. India* **20:** 78-80.

Tripathi, S. K. M. & Singh, H. P. (1985). Palynology of the Jaintia Group (Palaeocene-Eocene) exposed along Jowai-Sonapur Road, Meghalaya, India, Part-I. Systematic palynology. *Geophytology* **15**(2): 164-187.

Venkatachala, B. S. & Berry, C. M. (1985). Source rock palynology of Upper Assam and Dhansiri Valley: A preliminary assessment. Petroliferous basins of India. III. *Petroleum Asia Journal* 7(2): 44-45.

Venkatachala, B. S. & Rawat, M. S. (1985). Palynofossils from the Bap Formation, Rajasthan, India. Presented at International Organization of Palaeobotanical Conference Edmonton, Alberta, Canada. *Bull. O.N.G.C.* **21**(2).

Vishnu-Mittre, Sharma, Aruna & Chanchala (1985). Palaeobotanical and pollen analytical investigations: A review. *Indian Archaeology*: 105-106.

Vishnu-Mittre & Sharma, Chhaya (1984). Vegetation and climate during the last glaciation in the Kathmandu Valley, Nepal. *Pollen Spores*, **26**(1): 69-94.

Vishnu-Mittre, Sharma, Chhaya, Saxena, A. K., Prasad, K., Bhattacharya, A. & Chauhan, M. S. (1984). Pollen stratigraphy of India. *Purattatava* **13** & **14**: 115-122.

Field Work

Field work was done around Chopan and Susnai to collect megascopic life, trace fossils and samples for studying microbiota from the Vindhyan succession. Samples from Glauconitic beds were collected for dating.

G. Rajagopalan, P. K. Maithy, A. P. Srivastava, Rupendra Babu and Kalayan L. Meena

A field trip to Chitrakut Banda District (U.P.—M.P.) was made to collect the samples from base granite, glauconite, sandstone and pellet from Lower Vindhyan exposures of the area.

G. Rajagopalan and A. P. Srivastava

Two field excursions were undertaken to Akbarpur for geological mapping and collection of material for petrography and biotic studies. Organo-sedimentary structures and Ichnofossils were also collected.

P. K. Maithy, G. Rajagopalan, Kedar Narain, Amar Sarkar and Vinod Yadav

Plant fossils and samples were collected from different seams and collieries of the Barakar and Raniganj formations of Raniganj Coalfield.

H. K. Maheshwari, A. K. Srivastava, Usha Bajpai, Rajni Tewari, V. K. Singh and H. N. Boral

An excursion was undertaken to the Rajmahal Hills to collect plant fossils from Hura Tract.

V. K. Singh

Plant fossils were collected from different beds of Umaria, Birsinghpur Pali, Anuppur and Marwas areas of Shahdol and Sidhi districts, M.P.

Shaila Chandra, A. K. Srivastava and K. J. Singh

A field excursion was undertaken to collect plant fossils from Jharia Coalfield, Bihar.

V. K. Singh

Bore core and outcrop samples were collected for palynological investigation from eastern Raniganj Coalfield, Panagarh Basin, West Bengal, Dewanganj area in between Ajoy River and Brahmini River, Rajmahal area in Santhal Pargana, Bihar.

R. S. Tiwari, Vijaya and Kindu L. Meena

Krol-Tal sections, Garhwal Syncline, lesser Himalayas were traversed and sequential collection along Ganga River between Rishikesh and Deoprayag were made.

R. S. Tiwari with S. Kumar,
(Geology Department, Lucknow University)

Bore-cores as well as out-crop samples from Ramakrishnapuram, Budharam, Chelpur and Satrepalli area of Godavari Graben have been collected.

Suresh C. Srivastava and Neerja Jha

An excursion was undertaken to South Rewa Basin for the collection of plant fossils.

Shyam C. Srivastava and S. R. Manik

An excursion to Surai Khola and Arjun Khola, Nepal was undertaken to collect leaves, carbonised woods and palynological samples from the Mahendra Raj Marg section belonging to the Siwalik sediments. This collaborative excursion was organized by Dr. G. Cornivus, Nepal Research Centre, Kathmandu.

N. Awasthi and Mahesh Prasad

An excursion to Khasi and Garo Hills, Meghalaya was undertaken in the area around Cherrapunji and Theriaghat in Khasi Hills. Some leaf impressions were collected from near Cherrapunji. Leaf-impressions were also collected in the Garo Hills from the road cutting near Damalgiri P. W. D. Inspection Bungalow.

N. Awasthi

Field excursion to Rajasthan and Gujarat was undertaken and a fairly good number of petrified woods from the Neogene sediments near Jaisalmer and carbonised woods from the Eocene sediments of Bharauch District were collected.

J. S. Guleria

A visit to Neyveli was undertaken to collect carbonised woods and leaves from the lignite mines. French Institute of Palynology, Pondicherry was also visited to consult the Herbarium and Library for identification of fossil plants.

Anil Agarwal

Field work was carried out in parts of Garo and Khasi Hills in Meghalaya to collect samples from Cretaceous-Palaeocene sequences.

K. P. Jain and Rahul Garg

An excursion to Ratnagiri and Sindhu Durg districts of Maharashtra was undertaken for the collection of lignite and associated rock samples from Ratnagiri beds. A total of 101 samples were collected from Nala/mine sections.

R. K. Saxena

Field work in the Cannanore District of Kerala was carried out and 110 samples of lignite and associated sediments from Payangadi, Nileshwar and Meenkunnu were collected.

M. R. Rao

An excursion was undertaken to Kashmir for collection and delimitation of lignite horizons.

Rakesh Saxena and O. S. Sarate

An excursion was undertaken to Rajmahal, East Bokaro and Umaria coalfields to collect coal seam samples, bore cores and some tectonically effected coal to understand the behaviour of rank. In the underground incline section at Govindpur, intrusion of a dyke which has effected the coal seams was recognised.

G. K. B. Navale, Rakesh Saxena and B. D. Singh

An excursion was undertaken to collect samples from nine bore hole cores drilled by the National Mineral Development Corporation around Barmer, Rajasthan.

R. K. Kar

Samples from the mud banks of Kerala coast and Vembanad Lake were collected from the Centre for Earth Science Studies, Trivandrum for palynological investigation to understand the depositional history of the mud banks.

B. S. Venkatachala and R. K. Kar

Palynological samples from Disang, Laisong, Jenum, Renjo and Bhuban formations exposed along Silchar-Half Long Road Section were collected in collaboration with the geologists of the Oil and Natural Gas Commission. The road section was measured by the Surveyor of the ONGC and 213 samples were collected covering these formations.

R. K. Kar

About 300 bore core samples of Cretaceous and Tertiary from various shallow wells of South India were collected from O.N.G.C.

A. Chandra

A field trip was undertaken to collect samples from Tura Formation, Garo Hills, Meghalaya.

K. Ambwani

Palynological samples from different coal seams of Langrin Coalfield, Garo Hills, Meghalaya were collected.

R. S. Singh

Field excursion was undertaken to Annamalai Hills in Tamil Nadu to collect palynological samples to study the Quaternary vegetational history.

H. P. Gupta and S. K. Bera

Field excursion was undertaken to Silent Valley in Kerala in order to collect palynological samples to study Quaternary vegetational history.

H. P. Gupta and S. K. Bera

Field trips were undertaken to Aragoccave, Tautaval and Lazaret, Nice, South France to participate in archaeological excavation and collection of soil profile. A distinction was obtained in exposing an extremely rare fossil bone-phalange of Early Man from the square allotted.

Chhaya Sharma

Undertook an excursion to achaeological site near Sturevagen, Bergen, Norway in order to collect palynological samples.

Chhaya Sharma

Papers read at Symposia/Conferences/Meetings

Abhay P. Srivastava—*Glauconite: Fission-track chronometer for dating sedimentary deposits.* Fourth National Seminar-cum-Workshop on Solid State Nuclear Track Detector : Application to Earth Sciences held at Wadia Institute of Himalayan Geology, Dehradun.

Abhay P. Srivastava—*F-T dating of Precambrian deposits of Vindhyan Group.* Fourth National Seminar-cum-Workshop on Solid State Nuclear Track Detectors : Application to Earth Science held at Wadia Institute of Himalayan Geology, Dehradun.

Anand-Prakash—*Biopetrology of Lower Gondwana coals of India.* Geological Institute of Moscow, U.S.S.R.

Anand-Prakash—*Genesis of Gondwana coals.* All Union Geological Institute, Leningrad, U.S.S.R.

Annamraju Rajnikanth—*Is man separate from the environment?* National Symposium on Challenges and excitements in science for youth" sponsored by the Department of Science and Technology held at the Physical Research Laboratory, Ahmedabad.

Asha Gupta—*A new species of Riccia (Mich) L. from near Malihabad, Lucknow, U. P.* VI Indian Geophytological Conference at the Birbal Sahni Institute of Palaeobotany, Lucknow.

Chandra M. Nautiyal—*40K-40Ar Dating programme at Birbal Sahni Institute of Palaeobotany: Instrumentation and objectives.* Symposium on Isotope-based studies on problems of Indian Geology held at the Presidency College, Calcutta.

Garud K. B. Navale—*Some causative factors for the formation of the variable Permian coal-types in India.* International conference on Coal Science, Sydney, Australia.

Garud K. B. Navale—*Anthracology of Indian coals.* Department of Geology, University of Wallongong, Australia.

Garud K. B. Navale – *Origin and nature of Permian coals of India.* Department of Geology, University of New Castle.

G. Rajagopalan—*Age determination of Saurashtra miliolites by Th-230/U-234 and C-14 methods.* National Workshop on Quaternary carbonates and miliolite problems of Gujarat held at Physical Research Laboratory, Ahmedabad.

Kripa S. Saraswat—*Pre-Harappan food economy at ancient Rohira, Punjab.* Annual Conference on Indian Archaeology held at National Museum, New Delhi.

Ram S. Tiwari—*Permo-Triassic boundary: A palynological approach.* Workshop on Gondwana of India held at Geological Survey of India, Calcutta.

Ranajit K. Kar--*Palynological correlation of the subsurface and surface sediments of Kerala Coast, India.* VI Indian Geophytological Conference held at Birbal Sahni Institute of Palaeobotany, Lucknow.

Ranajit K. Kar—*Palynological evidence on floral evolution in Kachchh, Gujarat in the last 60 million years.* National Seminar on Recent Trends in Plant Science Research held at Visva-Bharati University.

Shyam C. Srivastava —*Indian Mesozoic pteridophytes.* Symposium on Recent Advances in Bryology and Pteridology held at Indian Botanical Conference, Hyderabad.

Lectures Delivered

Chhaya Sharma—*Methodology and pollen analytical investigation of Arago sediments.* Arago Cave, Tautavel, France.

Hari P. Gupta—*Palynology in the service of mankind.* Lucknow Christian College, Lucknow.

G. Rajagopalan—*Dating methods.* National Laboratory for Conservation of Cultural Properties, Lucknow.

Ram S. Tiwari—*Palynology and its application in coal and petroleum exploration.* Hindustan Aeronautics Ltd. School, Lucknow.

Vishnu-Mittre—Palaeoethnobotany: Diffusion of floras and origins and history of crops. Training Course in Ethnobotany, N.B.R.I., Lucknow.

Technical Assistance Rendered to other Agencies

A. Training Provided

Mr C. Mohan Dass, College of Engineering, Madras was imparted training on various maceration techniques.

Kumari Hansa Joshi, Wadia Institute of Himalayan Geology, Dehradun was provided training in palynological techniques, morphotaxonomy, interpretation of data and its application in relevant fields.

Ms Lynda Prabhakar, Department of Geology, Nagpur University, Nagpur was imparted training on the Precambrian life and methods of study.

B. Technical Assistance

Central Mining, Planning and Design Institute of Coal India Ltd.

A detailed report on coal characterization, rank evaluation and correlation of coal seams of Singrauli Coal Basin was sent to the Chief Geologist.

Neyveli Lignite Corporation

Reflectance measurements of lignite samples from 3 bore-core samples are being carried out for quality determination.

Wadia Institute of Himalayan Geology

A report on the study of coals and coal balls from Arunachal Pradesh has been submitted to the organization.

Radiocarbon dating of samples of geological and archaeological importance was done on the materials supplied by the following :

(i) S. B. Bhatia, Geology Department, Panjab University, Chandigarh—Kankar samples from Haryana.

(ii) Sunirmal Chanda, Bose Institute, Calcutta—peat and sediments from West Bengal

Geological Survey of India

A. B. Goswami, Quaternary sediment samples from West Bengal and Bihar.

Calcareous sediment, peat and sediment samples from Assam and Arunachal Pradesh.

Bore core samples from Rajmahal Basin, Panagarh Basin and Godavari Graben have been palynologically dated and the reports have been communicated.

Deccan College

Dating of cultural sequences in Andaman Island—Charcoal samples from Andaman Island.

Deputation/Training/Study Abroad

Chhaya Sharma

Visited France under Indo-French bilateral exchange programme of scientists for advance training in palynology for one year (September 6, 1984—September 5, 1985). During the period worked chiefly in the palynological laboratory at the Institute de Paleontologie Humaine, Paris and carried out pollen analytical investigations of the material from the archaeological site caune de l' Arago, Tautavel, South France.

Also visited several laboratories, viz., Laboratoire de Micropaleontologie de l' Universite Pierre et Marie Curie, Laboratoire de Anthropologie, Universite d' Aix-Marseille II and Geomorphological Institute Caen. Also deputed to Norway under Indian National Science Academy (INSA), New Delhi and Norwegian Academy of Science and Letters (NASL), Oslo for six weeks (March 31, 1985—May 12, 1985). During this period visited different Laboratories at Oslo, Bergen and Trondheim namely Institute for Geology, Biological Section (Blindern University), Botanical Museum at Oslo ; Botanical Institute (University of Bergen), Forest Research Institute at Bergen; Botanical Institute, Archaeological Museum (Botany Section), Geological Survey (Quaternary Division of Palynology Section) and Dragvoll University at Trondheim.

Krishna Ambwani

During the month of September, 1985 undertook a training programme in Scanning Electron Microscopy at Cambridge (U. K.) and Eindhoven (Holland).

Garud K. B. Navale

Attended an International Coal Science Conference and presented a paper on the Indian coals held in Sydney during October-November, 1985. He also participated in the technical tour programmes, visited coal laboratories, institutions, coalfields in Sydney, Wolongong, New Castle and Latrobe coal basins.

Anand-Prakash

Visited U.S.S.R. under INSA-U.S.S.R. Academy of Sciences, Moscow, a collaborative programme for two months during October-November, 1985 and worked in the Geological Institute of the U.S.S.R. Academy of Sciences, Moscow and All Union Geological Institute of Science, Leningrad.

Publication and Information Section

Publication

'The Palaeobotanist'

Volume 34 of the international journal was brought out as a combined volume including numbers 1, 2 and 3. The present format and size of the journal has been changed from Volume 35 which is in Press.

Birbal Sahni Memorial Lecture

The fourteenth lecture entitled '*On the mixed Permian floras of Gondwanas and Cathaysia or Euramerica*', delivered by Professor Li Xingxue, Nanjing Institute of Geology and Palaeontology, China is under publication.

Sir Albert Charles Seward Memorial Lecture

The Thirtythird lecture entitled 'Analysis of some palaeogeographic and palaeoecologic problems of palaeobotany' delivered by Professor Daniel I. Axelrod, University of California, USA is also under publication.

Annual Report

The Institute's Annual Reports, both in English and Hindi, were compiled, translated and published. This year the publications of the Institute netted an income of Rs. 1,73,581.06, out of which about Rs. 73,949.00 were earned in foreign exchange approximately equivalent to US $ = 4,750.40 plus £ = 783.25.

Library

The Library of the Institute holds a large collection of books, journals, reprints, theses, reports, maps and atlases. Their details are as follows:

Particulars	Position on 31.3.1985	Additions during 1985-1986	Total
Books	3,915	77	4,028
Journals	7,854	323	8,177
Reprints	29,912	766	30,678
Microfilms/fisches	289	1	290
Theses	53	3	56
Reports	45	1	46

Maps and Atlases	48	— 3	51
Reference Books	157	7	164

Eighty-seven current periodicals are being subscribed by the Institute's Library.

The total number of registered borrowers of the Institute's library is 135. 136

Exchange Programme

A special programme to disseminate published palaeobotanical literature of the Institute is being carried out resulting with generation of scientific exchanges with other institutions in India and abroad. The main achievements of this programme are:

(*i*) Number of research papers whose reprints were purchased for exchange .. 29

(*ii*) Total number of reprints sent out in exchange .. 1,923

(*iii*) Number of institutions on exchange .. 58

(*iv*) Number of individuals on exchange .. 421

(*v*) Sets of papers of Professor Birbal Sahni sent .. 6

(*vi*) Number of periodicals on exchange .. 68

Current Awareness Service

(*i*) A '*Quarterly List*' of new additions to the library, i.e. books, reprints and journals as well as titles called from various journal was compiled in order to keep the readers in touch with the latest acquisitions in the Library. This service is also made available to other Indian scientific organizations and universities.

The services of the Library were also made available to scientists from other organisations and universities.

Museum

A reconstruction of a twig of *Glossopteris* was made and has been displayed in the Museum.

Under a special programme 'Palaeobotany in Education' sets of fossil specimens were gifted to 11 institutions in the country in order to disseminate the palaeobotanical knowledge. Coloured transparencies of the series of paintings on 'Plant life through the ages' and collection in the Museum were made as lecture aid for use by scientists.

The type repository of the Museum is being reorganised. An alphabetical list of research papers whose type material deposited in the Museum is being prepared as a part of this inventory.

Type and Figured Specimens/Slides/Negatives

The Repository of the Museum holds Type and Figured specimens, Type and Figured slides and Negatives. The details are as under:

Type and figured specimens	4,019
Type and figured slides	8,908
Negatives	10,114

New Collection

The scientists of the Institute during the year added collections from about 150 localities. The details are as under:

	Specimens	*Samples*
Department of Non-vascular Plants	240	325
Department of Palaeophytic Evolutionary Botany	902	—
Department of Cenophytic Evolutionary Botany	831	41
Department of Pre-Gondwana & Gondwana Palynostratigraphy	45	2,186
Department of Post-Gondwana Palynostratigraphy of Peninsular India	—	715
Department of Post-Gondwana Palynostratigraphy of Extra-Peninsular India	—	122
Department of Biodiagenesis	—	64
Department of Radiometric Dating	18	—
O.N.G.C. Project	—	346

'Paleobotany for Education' Programme

Under this programme a large number of fossil specimens were gifted to the followings:

Department of Geology, Kumaon University, Nainital
Department of Botany, Holkar Science College, Indore
Department of Botany, Dayanand Arts & Science College, Sholapur
Department of Geology, G. C. College, Silchar
Department of Geology, Bhopal University, Bhopal
Department of Geology, Jai Hind College, Dhule
Department of Plant Science, Rohilkhand University, Bareilly
Department of Botany, Giradhar Barku Patel Science College, Shahada
Government M. A. M. College, Jammu
R. K. Talreja College of Arts, Science & Commerce, Ulhasnagar
Department of Botany, B. A. S. C. College, Beed.

Specimens/samples received

A large number of specimens/samples were received from:
Geology Department, Panjab University, Chandigarh
Geological Survey of India, Calcutta
Geology Department, Andhra University, Waltair
Department of Epigraphy, Tamil University, Thanjavur
German Democratic Republic.

Visitors during the year

A large number of visitors from Australia, France, Bhutan, Lebanon, Germany, United States of America, Japan and Philippines visited the Institute and Museum. Delegates of the VI Indian Geophytological Conference and students from the following educational institutions of India also visited the Institute and used the Museum facilities.

D. B. B. College, Nainital
Post Graduate College of Sciences, Raipur
Department of Botany, Vikram University, Ujjain
St. Andrews College, Gorakhpur
A. N. D. M. M. College, Kanpur
Botany Department, Gulbarga University, Gulbarga
Post-Graduate College, Pithoragarh
Presidency College, Calcutta
Government College of Science, Rewa
Institute of Science, Nagpur
Pandu College, Gauhati
Department of Botany, Lucknow University, Lucknow

Herbarium

The Institute maintains a Herbarium for detailed comparative studies. The details of herbarium sheets, wood specimens, pollen slides, wood slides, fruits and seeds are as follows:

Details	Position on 1.4.1985	Addition during the year	Total as on 31.3.1986
Herbarium sheets	10,629	251	10,880
Wood specimens	3 458	98	3,596
Pollen slides	10,624	281	10,905
Wood slides	3,951	58	4,009
Fruits and seeds	1,863	10	1,873

Two hundred fiftyeight pteridophytic plants were accessioned and 300 plant specimens, mostly in fruiting condition, were collected from Annamalai and Silent Valley forests, out of which 100 specimens have been identified. In addition, about 60 seeds and fruits were collected for the Carpothek of the Herbarium.

Exchange Programme

Some wood specimens were sent to our Herbarium by the followings:

The Officer-in-charge, Wood Anatomy Branch, Forest Research Institute, Dehradun

Institute Nacional de Investigacions Forestales, Mexico

Similarly, some wood specimens were also sent to:

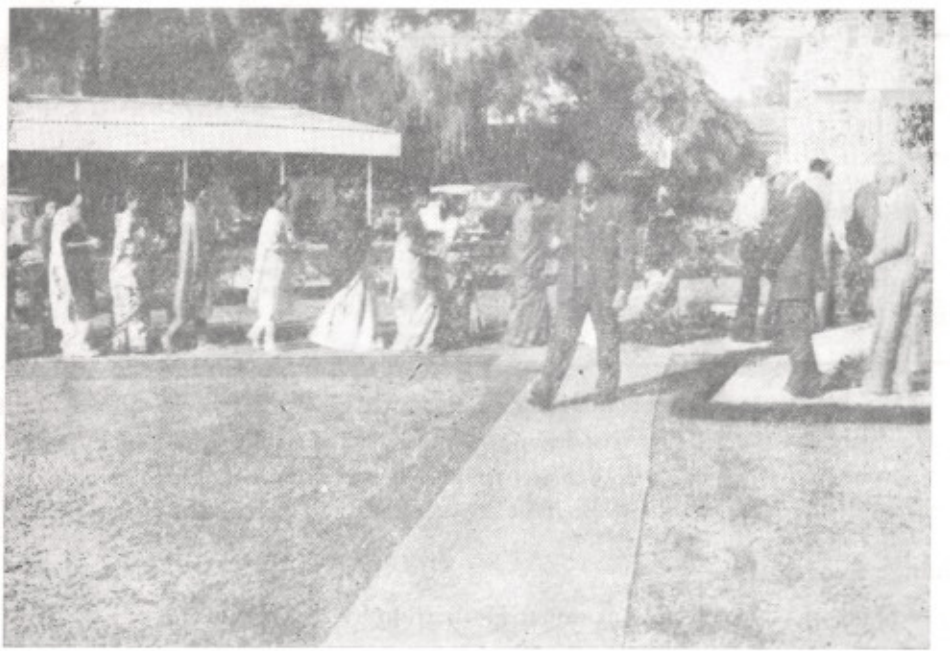
Dean and Professor, College of Forestry, Kanjweaon National University, Chuncheon 200, Korea.

Director, Institute Nacional de Investigaciones Forestales, Mexico.

Officer-in-charge, Wood Anatomy Branch, Forest Research Institute, Dehradun.

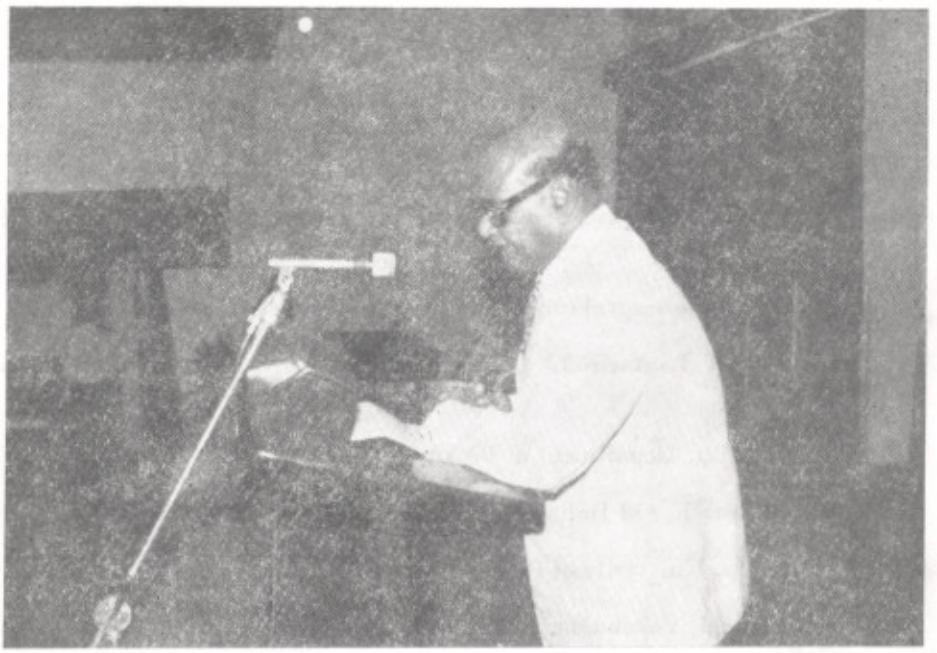
Founder's Day Celebrations

The Birthday of founder, Professor Birbal Sahni, was celebrated on 14th November, 1985. In the morning, the wreaths and flowers were placed on the '*Samadhi*' of Professor Sahni by the Institute's staff and several other distinguished persons. In the evening, the '*Samadhi*' was decorated by flowers and garlands.



Staff of the Institute and other distinguished persons offering *Pushpanjali* on Prof. Sahni's Samadhi.

The main function started at 4.00 p.m. with *VANDANA*. Thereafter Dr B. S. Venkatachala, Director, welcomed the Chief Guest and other guests present in the Auditorium. Then at 5.00 p.m. Dr K. R. Surange delivered the 15th Birbal Sahni Memorial Lecture entitled ''Gondwana floras : Problems and possibilities''.



Dr K. R. Surange delivering the 15th Birbal Sahni Memorial Lecture.

Next day on November 15, 1985 at 4.00 p.m. the 33rd Sir Albert Charles Seward Memorial Lecture entitled "Analysis of some palaeogeographic and palaeoecologic problems of palaeobotany" was delivered by Prof. Daniel I. Axelrod, Department of Botany, University of California, U.S.A.

Distinguished Visitors

The Institute had the pleasure to welcome the following Distinguished Visitors during the year:

Mr J. Bruce Waterhouse, Geology Department, University of Queensland, Australia.

Mr Rovcicose Sean Seagt, France.

Professor Daniel I. Axelrod, Department of Botany, University of California, Davis, USA.

Professor S. S. Bir, Department of Botany, Panjabi University, Patiala.

Dr S. N. Visvanath, Oil India Limited, Duliajan.

Dr G. Corviuus, University of Elangen, Germany.

Ms Mari Sekjuchi, Yakohama, Japan.

Dr S. Z. Qasim, Secretary to the Government of India, Department of Oceanic Development, Mahasagar Bhavan, New Delhi.

Dr M. S. Chadha, Bhabha Atomic Research Centre, Trombay, Bombay.

Professor J. J. Shah, Department of Microbiology and Biochemistry, University of Vadodara, Vadodara.

Professor Rama, Tata Institute of Fundamental Research, Bombay.

Internal Committees

Building Construction & Maintenance Committee

H. K. Maheshwari	—	Chairman
Anand-Prakash		
S. B. Verma		
Deputy Registrar (E)		
P. K. Bajpai		

Canteen Committee

Sukh-Dev	—	Chairman
P. K. Bajpai	—	Secretary
Ms Kamla Amarlal	—	Treasurer
Shyam C. Srivastava		
Ms Rita Banerjee		
A. K. Bhattacharya		
H. S. Srivastava		

Data Handling Committee

H. P. Singh	—	Chairman
G. Rajagopalan		
R. S. Tiwari		

Electron Microscope Committee

G. Rajagopalan	—	Chairman
K. Ambwani		
Rahul Garg		
Ms Usha Bajpai		

Excursion Committee

H. P. Singh	—	Chairman
P. K. Maithy		
R. K. Saxena		

Garden Committee

R. K. Kar	—	Chairman
B. N. Jana		
R. R. Yadav		
Samir Sarkar		
M. R. Rao		

Herbarium Advisory Committee

H. P. Singh — Chairman
Nilamber Awasthi
H. P. Gupta

Instrumentation & Maintenance Committee

H. P. Singh — Chairman
H. P. Gupta
B. K. Misra

Library Advisory Committee

H. P. Singh — Chairman
Suresh C. Srivastava
J. S. Guleria

Maceration Committee

Suresh C. Srivastava — Chairman
K. P. Jain
H. N. Boral

Museum Advisory Committee

H. P. Singh — Chairman
Ms Shaila Chandra
Shyam C. Srivastava

Photography Committee

K. P. Jain — Chairman
Anil Chandra
Ms Vijaya

Programme Committee

R. S. Tiwari — Chairman
Ms Shaila Chandra
Anand-Prakash

Publication & Information Advisory Committee

H. P. Singh — Chairman
H. K. Maheshwari
R. S. Tiwari
J. S. Antal

Purchase Committee

B. S. Venkatachala — Chairman
K. P. Jain

M. B. Bande
S. B. Verma
N. K. Khasnavis
Accounts Officer

Quality Control Committee

M. B. Bande — Chairman
B. K. Jain
Bhagwan Singh

Research Programming & Monitoring Committee

H. P. Singh — Chairman
G. K. B. Navale
K. P. Jain
H. K. Maheshwari
R. S. Tiwari

Vehicle Maintenance Committee

Anand-Prakash — Chairman
S. B. Verma
S. K. Suri

Technical and Administrative Personnel

Publication & Information Section

Publication

Jaswant Singh, M.Sc. (Joint Editor)

Library

Jagendra N. Nigam, B.A.,B.Lib.Sc. (Librarian)
Gopi K. Gupta, B.Sc.,B.Lib.Sc. (Library Assistant)
Ms Kavita Sangal, B.Sc.,B.Lib.Sc. (Library Assistant)

Museum

Gajendra P. Srivastava, M.Sc. (Curator)
Naresh C. Saxena, B.A. (Museum Assistant)
Prem Prakash, B.Sc. (Jr. Museum Assistant)
Sant R. Yadav, B.A. (Fossil Cataloguer)

Herbarium

Hafiz A. Khan, Ph.D. (S.S.O. Curator)
Jagdish C. Srivastava, M.Sc. (Herbarium Incharge)
Diwakar Pradhan, B.Sc. (Herbarium Incharge)
Ajai K. Singh Rathore, B.Sc.,B.Lib.Sc. (Herbarium Incharge)

Laboratory Services

Hirendra N. Boral, B.Sc. (J.T.O.)
Balasubramaniam Sekar, B.Sc.,A.I.C. (J.T.O.)
Ms Asha Guleria, B.Sc. (S.T.A.)
Mr Madhabi Chakraborty, B.Sc. (S.T.A.)
Ms Kamla Amarlal, B.Sc. (S.T.A.)
Inder J. Mehra, B.A. (Lab. Assistant)
Tapan K. Mandal, B.Sc. (S.T.A.)
Dinesh C. Joshi, B.Sc. (J.T.A.)
Ms Sangita Gupta, B.Sc. (Lab. Assistant)
Ms Reeta Banerjee, B.Sc. (Lab. Assistant)
Vijai P. Singh, B.Sc. (Lab. Assistant)
Ramesh C. Misra, B.Sc. (Lab. Assistant)

Technical Services

Vijai S. Panwar (Glass Blower)
Pritam S. Saluja (Mechanic)
Alok K. Ghosh (Electrician)

Mahipal Singh (Mechanic)
Bhim Singh (Mechanic-cum-Section Cutter)
Chandra Bali (Section Cutter)
Chhotey Lal (Section Cutter)

Photography and Drawing

Paresh C. Roy (Photographer)
Pramod K. Bajpai (Artist)
Pradeep Mohan (Dark-Room Assistant)

Administration

Surendra B. Verma, M.A.,B.Com.,D.P.A. (Registrar)
Sukh D. Mehtani (Deputy Registrar)
Sudarshan K. Suri (Stenographer)
Suraj P. Chadha, B.A. (P.A. to Director)
Hari S. Srivastava, B.Com. (Office Assistant)
Bhagwan Singh (Assistant)
Ms Prem Kanti Srivastava (Receptionist)
Radha Ballabh Kukreti (Care-taker)
Inder J. S. Bedi (U.D.C.)
Ramesh Chandra (U.D.C.)
Nitya N. Johi (U.D.C.)
Ms Ruchita Bagchi, B.A. (L.D.C.)
Ms Usha Chandra (Telephone Operator)
Jagannath Prasad, B.A. (L.D.C.)
Ms P. Thomas (L.D.C.)
Joseph George (L.D.C.)
Hari lal (L.D.C.)
Kosy Thomas (L.D.C.)

Accounts Section

Tej N. Shukla, B.A. (Accountant)
Baresh K. Jain, B. A. (Assistant Finance & Accounts)
Raj K. Takru, B.A. (U.D.C.)
Raj K. Kapoor, B.A. (L.D.C.)
Ms V. Nirmala (L.D.C.)
Dhoom Singh, B.A. (L.D.C.)

Store

Nirmal K. Khasnavis, B.Sc.,LL.B. (Deputy Registrar)
Harjeet Singh, B.A. (Store Keeper)

O.N.G.C. Sponsored Project "Mesozoic sediments of Kachchh Basin"

Chandra Pal, B.Sc. (J.T.A.)

O.I.D.B. Projects

(*i*) Palynological studies of the Barail Sequence in the type area with special reference to Kopili-Barail and Barail-Surma transition

(*ii*) Detailed palynological studies of Tipam-Surma units, Girujan Clay and Namsang Sandstone/Clay

Ms Geeta Saxena, M.Sc. (S.T.A.)
Eknath G. Khare, B.Sc. (S.T.A.)
Keshav Ram (J.L.A.)
Krishnanand, B.Sc. (J.T.A.)
Ms Madhulika Verma, M.Sc. (J.T.A.)

Appointments and Promotions

Director

Dr B. S. Venkatachala assumed the charge of Director of the Institute w.e.f. 6.6.1985.

Department of Non-vascular Plants

Shri Kalyan L. Meena, JSA, was promoted as Senior Scientific Assistant w.e.f. 1.4.1985.

Department of Palaeophytic Evolutionary Botany

Shri V. K. Singh, JSA was promoted as Senior Scientific Assistant w.e.f. 1.4.1985.

Department of Mesophytic Evolutionary Botany

Dr Shyam C. Srivastava, SSO, was promoted as Assistant Director w.e.f. 31.1 1986.

Shri S. R. Manik, JSA, was promoted as Senior Scientific Assistant w.e.f. 23.9.1985.

Ms Neeru Pandya, JSA, was promoted as Senior Scientific Assistant w.e.f. 1.4.1985.

Department of Cenophytic Evolutionary Botany

Shri Mahesh Prasad, JSA, was promoted as Senior Scientific Assistant w.e.f. 1.4.1985.

Ms Rashmi Srivastava, JSA, was promoted as Senior Scientific Assistant w.e.f. 23.9.1985.

Department of Quaternary Biogeography and Archaeobotany

Ms Chanchala, SSA, was promoted as Junior Scientific Officer w.e.f. 11.4.1985.

Department of Pre-Gondwana and Gondwana Palynostratigraphy

Sri Ram Awatar, JSA, was promoted as Senior Scientific Assistant w.e.f. 1.4.1985.

Sri Kindu L. Meena, JSA, was promoted as Senior Scientific Assistant w.e.f. 1.4.1985.

Department of Post-Gondwana Palynostratigraphy of Peninsular India

Sri G. K. Trivedi, JSA, was promoted as Senior Scientific Assistant w.e.f. 1.4.1985.

Sri B. D. Mandaokar, JSA, was promoted as Senior Scientific Assistant w.e.f. 23.9.1985.

Sri Madhav Kumar, JSA, was promoted as Senior Scientific Assistant w.e.f. 1.4.1985.

Department of Post-Gondwana Palynostratigraphy of Extra-Peninsular India

Dr A. P. Bhattacharyya, JSA, was promoted as Senior Scientific Assistant w.e.f. 1.4.1985.

Department of Biodiagenesis

Dr Anand-Prakash, SSO, was promoted as Assistant Director w.e.f. 31.1.1986.

Dr O. S. Sarate, JSA, was promoted as Senior Scientific Assistant w.e.f. 1.4.1985.

Department of Radiometric Dating

Dr C. M. Nautiyal was appointed as Senior Scientific Officer w.e.f. 15.4.1985.

Laboratory Services

Sri L. M. Sanwal was appointed as Junior Technical Assistant w.e.f. 10.5.1985.

Sri B. K. Tripathi was appointed as Junior Technical Assistant w.e.f. 2.5.1985.

Mr D. C. Joshi, JTA, was promoted as Senior Technical Assistant w.e.f. 23.9.1985.

Ms Sangita Gupta, JLA, was Promoted as Laboratory Assistant w.e.f. 23.9.1985.

Sri A. K. Ghosh, Electrician, was given the higher grade w.e.f. 25.3.1986.

Sri R. C. Misra, JLA, was promoted as Laboratory Assistant w.e.f. 25.3.1986

Sri V. P. Singh, JLA, was promoted as Laboratory Assistant w.e.f. 25.3.1986.

Administration

Ms Swapna Acharya was appointed as Lower Division Clerk w.e.f. 16.1.1986.

Sri K. P. Singh was appointed as Lower Division Clerk w.e.f. 16.1.1986.

Sri Gopal Singh was appointed as Lower Division Clerk w.e.f. 16.1.1986.

Sponsored OIDB Project

Ms Geeta Saxena was appointed as Senior Technical Assistant w.e.f. 19.8.1985.

Sri E. G. Khare was appointed as Senior Technical Assistant w.e.f. 19.8.1985.

Sri Keshav Ram was appointed as Junior Technical Assistant w.e.f. 19.8.1985.

Sri V. K. Upadhyay was appointed as Junior Laboratory Assistant w.e.f. 19.8.1985.

Ms Madhulika Verma was appointed as Junior Technical Assistant w.e.f. 19.8.1985.

Sri A. K. Bhattacharya was appointed as Junior Laboratory Assistant w.e.f. 19.8.1985.

Sri Krishnanand was appointed as Junior Laboratory Assistant w.e.f. 19.8.1985.

DST Project

Sri V. K. Yadava was appointed as Junior Research Fellow w.e.f. 1985.

Retirements

Shri Roop Chand, Lab. Attendant, retired on 31st October, 1985.

Dr Uttam Prakash, Deputy Director, retired on 31st December, 1985.

Shri Bhim Singh, Section Cutter, retired on 31st December, 1985.

AUDITOR'S REPORT
OF
BIRBAL SAHNI INSTITUTE OF PALAEOBOTANY, LUCKNOW

We have audited the annexed Balance Sheet of the Birbal Sahni Institute of Palaeobotany, Lucknow as at 31st March, 1986 and also the relevant Income and Expenditure Account and Receipts and Payment Account for the year ended on that date with the account books, vouchers, information and explanation furnished to us.

We report that to the best of our information and according to the explanations given to us, in our opinion, the Balance Sheet read with notes thereon, shows a true and correct state of affairs of the Institute as at 31st March, 1986 and the Income & Expenditure Account gives a true and fair view of income over expenditure.

For R. N. KHANNA & COMPNNY
Chartered Accountant

(Sd. R. N. KHANNA)
Partner
M. No. F-13255

NOTES ON BALANCE SHEET OF BIRBAL SAHNI INSTITUTE OF PALAEOBOTANY, LUCKNOW AS AT 31ST MARCH, 1986

1. The Institute maintains the Accounts on cash system.

2. No depreciation are provided on fixed Assets. The fixed assets are shown at cost.

3. The Assets were created out of the recurring grants received during the year:

Books & Journals	Rs. 11,000.00

4. In the absence of classified details of completed building works, the sum of Rs. 32,52,634.58 have been shown as 'Building Works under Construction'. Efforts should be made to classify the capitalisation under the various works.

For R. N. KHANNA & COMPANY
Chartered Accountants

(Sd. R. N. KHANNA)
Partner

Place: Lucknow

Statement of Accounts for the year 1985-86

Birbal Sahni Institute

Balance Sheet as on

Liabilities	Amount Rs.	Amount Rs.
Capital Fund:		
Balance as per last years Balance Sheet ..	1,55,26,576.34	
Add: Government of India Grants as Capital Accounts ..	29,56,858.00	
Accrual Grant ..	2,34,818.00	1,87,18,252.34
Advance Funds for Employees:		
As per last years Balance Sheet..	5,84,223.00	
Advance during the year ..	4,03,570.00	
	9,87,793.00	
Less: Recovery during the year	83,126.00	9,04,667.00
Excess of Income over Expenditure ..	10,93,143.15	
Less: Transfer from Advance Fund ..	3,20,444.00	7,72,699.15
Donated Funds/Grants:		
Cost of Land donated by U. P. Govt. ..	32,292.00	
Founder's Donation ..	1,52,500.00	
C. D. Pant Memorial Fund ..	2,279.38	
C. L. Katiyal Memorial Fund	3,705.08	
P. C. Bhandari Memorial Fund	4,017.70	

of Palaeobotany, Lucknow

31st March, 1986

Assets	Amount Rs.	Amount Rs.
Fixed Assets:		
Land (Donated by Govt. of U. P.) ..		32,292.00
Works & Building:		
(i) **Building:**		
As per last year's Balance Sheet ..	17,26,652.04	
(ii) **Building Works under Construction:**		
Additions during the year 1982-83 ..	9,25,836.18	
Less: Sale proceeds of Cement ..	58,300.00	
	8,67,536.18	
Additions during the year 1983-84 ..	10,38,988.91	
Additions during the year 1984-85 ..	8,94,139.81	
Additions during the year 1985-86 ..	4,51,969.68	49,79,286.62
Research Apparatus & Equipments:		
As per last year's Balance Sheet	40,18,192.53	
Additions during the year ..	3,81,699.46	43,99,891.99
Workshop Equipment:		
As per last year's Balance Sheet		67,374.85

Liabilities	Amount Rs.	Amount Rs.
A. C. Seward Memorial Fund ..	13,115.58	
Other Misc. Donations ..	12,982.34	
M. G. T. Scheme (C.S.I.R.) ..	8,100.79	
Coal Scheme (C.S.I.R.) ..	7,784.66	
Palynological Scheme (C.S.I.R.)	5,207.87	
UNESCO Aid Fund ..	19,629.75	
Burmah Oil Co. Donation ..	1,900.00	
Rajasthan Scheme (sponsored by University of Wisconsin) ..	23,009.15	
Gift in Kind:		
Humboldt Foundation (West Germany) ..	75,000.00	
P. K. Srivastava Memorial Fund	3,130.85	
Birbal Sahni Research Award Endowment ..	24,252.75	
Prof. T. Maxwell Harris Endowment ..	7,550.00	3,96,457.90
General Provident Fund/ Contributory Provident Fund		24,01,741.18
Current Liabilities and Provisions:		
Security & Earnest Money Deposit ..		80,752.82
Total		2,32,74,570.40

Assets	Amount Rs.	Amount Rs.
Office & Miscellaneous Equipments:		
As per last year's Balance Sheet	2,83,443.56	
Additions during the year ..	35,128.68	3,18,572.24
Establishment of C-14 Radiometric Lab :		
As per last year's Balance Sheet	26,55,862.71	
Additions during the year ..	58,022.75	27,13,885.46
Plant & Machinery:		
As per last year's Balance Sheet	8,28,880.94	
Additions during the year ..	6,18,881.24	14,47,762.18
Apparatus & Equipment (Donated):		
M. G. T. Scheme (C.S.I.R.) ..	7,155.79	
Burmah Oil Co. ..	700.00	
Founder's Donation ..	2,500.00	
Coal Scheme (C.S.I.R.) ..	6,645.29	
Palynological Scheme (C.S.I.R.) ..	5,207.87	
Rajasthan Scheme (Sponsored by University of Wisconsin) ..	21,138.90	
UNESCO Aid Equipment ..	19,629.75	
Humboldt Foundation (West Germany) ..	75,091.50	1,38,069.10
Vehicles:		
As per last year's Balance Sheet		2,88,685.07

Liabilities	Amount Rs.	Amount Rs.
Total B/F		2,32,74,570.40
Total		2,32,74,570.40

Assets	Amount Rs.	Amount Rs.
Furniture & Fixtures:		
As per last year's Balance Sheet	11,87,178.78	
Additions during the year ..	3,29,499.80	15,16,673.58
Furniture & Fixtures (Donated):		
Burmah Oil Company ..	1,200.00	
M.G.T. Scheme (C.S.I.R.) ..	945.00	
Coal Scheme (C.S.I.R.) ..	1,139.37	
Rajasthan Scheme (Sponsored by University of Wisconsin) ..	979.70	4,264.07
Books & Journals:		
As per last year's Balance Sheet	6,90,604.92	
Additions during the year ..	1,23,138.62	
Out of Revenue Account ..	20,287.70	8,34,031.24
Founder's Library (Donated)		50,000.00
Founder's Fossil Collection (Donated) ..		50,000.00
Maps & Topo-Sheets:		
As per last year's Balance Sheet	13,142.00	
Additions during the year ..	—	13,142.00
Investment (Bank Guarantee) (for A.C.C. Unit) ..		13,000.00
UNESCO Book Coupons ..		793.02
Investment (Donation Accounts) ..	62,000.00	
Add: Investment During the Year ..	5,687.50	67,687.50
Accrual Grant		2,34,818.00
Cash and Bank Balances:		
Cash in Hand	408.55	

Liabilities	Amount Rs.	Amount Rs.
Total B/F		2,32,74,570.40
Grand Total		2,32,74,570.40

(Sd.)	(Sd.)	(Sd.)
S. B. Verma	T. N. Shukla	B. S. Venkatachala
Registrar	*Accountant*	*Director*
Birbal Sahni Institute of Palaeobotany, Lucknow	Birbal Sahni Institute of Palaeobotany, Lucknow	Birbal Sahni Institute of Palaeobotany, Lucknow

Assets	Amount Rs.	Amount Rs.
Current Account with State Bank of India	9,68,163.80	9,68,572.35
Loans and Advances :		
Unsettled Advances : Plan Revenue Account ..	51,275.70	
Unsettled Advances: Plan Capital Account ..	17,33,405.25	
Unsettled Advances: Non-Plan Revenue Account ..	32,630.00	
Unsettled Advances: D. S. T. Project ..	3,100.00	
Unsettled Advances: O.I.D.B. Project ..	8,950.00	18,29,360.95
Advances to Employees		
House Building Advance ..	8,08,645.00	
Festival Advance ..	20,700.00	
Conveyance Advance ..	75,322.00	9,04,667.00
General Provident Fund/ Contributory Provident Fund		
Investments ..	14,75,000.00	
Advance out of G.P.F. ..	2,60,238.00	
Insurance out of G.P.F. ..	5,786.00	
With State Bank of India ..	6,60,717.18	24,01,741.18
Grand Total ..		2,32,74,570.40

Auditor's Report

As per our attached Report of even date

For R. N. KHANNA & CO.
Chartered Accountant

(Sd. R. N. KHANNA)
Partner

Birbal Sahni Institute

Income and Expenditure Account

Expenditure	Plan Rs.	Non-Plan Rs.	Total Rs.
Academic Expenses:			
To pay and Allowances of Academic Staff ..	1,82,099.84	21,54,648.94	23,36,748.78
To Field excursion ..	32,783.94	25,337.02	58,120.96
To Remuneration of Birbal Sahni Professor ..	—	—	—
To Sponsoring & Participation in Conferences & Symposia etc..	8,783.13	—	8,783.13
To Honorarium to lecturers:			
For Birbal Sahni Mem. Lecture	—	500.00	500.00
For Silver Jubilee Mem. Lecture ..	—	—	—
To International Programme:			
Deputation abroad ..	17,076.70	—	17,076.70
Honorarium for visiting Scientist ..	—	—	—
To Expenses of Services Ancillary to Research:			
To Pay & Allowances of Aux. Tech. Staff ..	31,647.29	7,30,516.07	7,62,163.36
To Chemicals & Glasswares, Photogoods & Small Apparatus etc. ..	1,76,600.87	1,13.932.51	2,90,533.38
To Library Requirements ..	—	32,178.31	32,178.31
To Museum Requirements ..	1,608.50	5,218.27	6,826.77
To Maintenance of Apparatus and Euipment & Workshop Machinery ..	39,575.92	—	39,575.92

of Palaeobotany, Lucknow

for the year ending 31st March, 1986

Income	Plan Rs.	Non-Plan Rs.	Total Rs.
Balance of last year's Grant of Revenue Account allowed for expenditure during current year ..	4,68,864.45	1,41,854.12	6,10,718.57
By Grants from Govt. of India ..	13,50,460.00	48,47,146.00	61,97,606.00
By Grant from U.P. Govt. on Revenue Account ..	—	5,000.00	5,000.00
By Sale proceeds of priced Publications:			
"The Palaeobotanits" ..	—	1,72,777.46	1,72,777.46
Monograph ..	—	300.00	300.00
Symposia & Spl. Publication ..	—	247.60	247.60
Seward Memorial Lecture ..	—	45.00	45.00
Birbal Sahni Memorial Lecture ..	—	24.00	24.00
Silver Jubilee Lecture ..	—	12.00	12.00
Picture Post Cards ..	—	202.50	202.50
Catalogue of Indian Fossil Plants ..	—	75.00	75.00
Aspects & Appraisal of Indian Palaeobotany ..	—	100.00	100.00
By Miscellaneous receipts and Recoveries:			
By Vehicle Charges ..	—	—	—
By Telephone Charges ..	—	697.00	697.00

Expenditure	Plan Rs.	Non-Plan Rs.	Total Rs.
To Publication Expenses:			
"The Palaeobotanist" ..	—	41,604.32	41,604.32
Birbal Sahni Memorial Lecture ..	—	—	—
Annual Report ..	—	13,976.35	13,976.35
Seward Memorial Lecture ..	—	—	—
Silver Jubilee Lecture ..	—	—	—
Travelling & Other Allowances:			
For Governing Body, Scientific Programme & Evaluation Committee and Selection Committee Meetings ..	37,168.55	9,841.10	47,009.65
For attending Scientific Meetings & Conferences in India and for other purposes ..	—	56,107.50	56,107.50
For Reimbursement of Medical Expenses ..	3,671.35	32,122.72	35,794.07
For Over Time Allowance ..	4,184.85	4,019.20	8,204.05
For Leave Travel Concession ..	16,313.60	24,938.05	41,251.65
For Reimbursement of Tuition Fees ..	—	391.50	391.50
For Children Education Allowance ..	—	—	—
For Funds for Training of Staff in India ..	—	—	—
To Pensionary Expenses:			
To Superannuation Allowance & Pension ..	—	5,24,431.83	5,24,431.83
Payment under Insurance Scheme ..	—	—	—

Income	Plan Rs.	Non-Plan Rs.	Total Rs.
By V. S. Room Charges ..	—	2,425.00	2,425.00
By Application Fees ..	—	217.00	217.00
Miscellaneous Receipts and Recoveries ..	4,105.65	18,655.82	22,761.47
Int. on Conveyance Advance ..	—	1,693.55	1,693.55
Pension Contribution ..	—	1,380.00	1,380.00
Employees Insurance Scheme ..	—	—	—
Deposit Account ..	—	—	—
Interest on Savings Bank Account ..	—	24,212.88	24,212.88
O.N.G.C. Project:			
Opening Balance ..	—	3,722.90	3,722.90
Grant ..	—	32,969.24	32,969.24
Misc./Receipts/Refunds ..	—	2,538.00	2,538.00
Oil Industry Development Board			
Opening Balance ..	—	(—) 16,083.36	(—) 16,083.36
Grant ..	—	1,30,000.00	1,30,000.00
U.G.C. Project:			
Opening Balance ..	—	(—) 4,749.42	(—) 4,749.42
Grant ..	—	17,000.00	17,000.00
All India Coordinated Research Project on Ethnobiology:			
Opening Balance ..	—	6,404.70	6,404.70
Grant ..	—	50,200.00	50,200.00

Expenditure	Plan Rs.	Non-Plan Rs.	Total Rs.
G. P. F. Interest ..	—	—	—
C. P. F. Contribution ..	—	4,920.00	4,920.00
To General Expenses:			
To Pay & Allowances of Administrative Staff ..	43,585.18	8,93,999.72	9,37,584.90
To Telephone & Trunk Call Charges ..	—	28,857.70	28,857.70
To Postage Charges ..	—	43,600.00	43,600.00
To Advertisement Charges ..	4,883.00	15,734.70	20,617.70
To Hot & Cold weather charges ..	2,200.00	20,090.00	22,220.00
To Petrol & Mobil Oil charges ..	5,117.88	10,040.14	15,158.02
To Electricity charges ..	1,07,487.64	44,693.60	1,52,181.24
To Municipal Taxes ..	—	—	—
To Insurance of Vehicle & Library ..	—	5,354.00	5,354.00
To Uniform to Class IV Staff ..	—	17,313.20	17,313.20
To Printing & Stationery ..	70,055.39	54,312.34	1,24,367.73
To Custom Duty & Port Trust Charges ..	—	377.40	377.40
To Railway Ft. & Carriage ..	—	3,750.30	3,750.30
To Entertainment Allowance to Director ..	—	4,618.70	4,618.70
To Miscellaneous & Unforeseen	58,249.47	69,255.05	1,27,504.52
To Maintenance Expenses:			
To Building ..	—	12,533.42	12,533.42
To Garden ..	—	5,078.51	5,078.51
To Vehicles ..	24,926.37	16,163.12	41,089.49

Income	Plan Rs.	Non-Plan Rs.	Total Rs.
D.S.T. Project: "Palaeobiology, Sedimentology & Stratigraphy"			
Opening Balance ..	—	33,336.93	33,336.93
Grant ..	—	35,000.00	35,000.00
D.S.T. Project II: "Comparative Morphotaxomic studies of Modern Algae of Kutch"			
Opening Balance ..		12,000.00	12,000.00
Total ..	18,23,430.10	55,19,403.92	73,42,834.02

Expenditure	Plan Rs.	Non-Plan Rs.	Total Rs.
To Repairs & Renewals ..	6,160.51	12,887.42	19.047.93
To Other Expenses:			
To Medical Advice ..	—	32.00	32.00
To Audit Fees ..	—	2,500.00	2,500.00
To Legal Advice ..	—	3,274.80	3,274.80
To Welfare Expenses:			
Financial Assistance to Departmental Canteen ..	—	4,914.00	4,914.00
Birbal Sahni Research Scholarship ..	—	39,586.71	39,586.71
Birbal Sahni Research Contingency ..	—	6,369.25	6,369.25
Emeritus scientists ..	—	44,310.14	44,310.14
O.N.G.C. Project:			
To Pay & Allowances ..	—	17,238.79	17,238.79
Chemicals & Glasswares ..	—	2,202.82	2,202.82
Miscellaneous ..	—	912.18	912.18
Oil Industry Development Board Project:			
To Pay & Allowances ..	—	91,493.46	91,493.46
Chemicals & Glasswares ..	—	—	—
Travelling Allowances ..	—	1,077.80	1,077.80
Miscellaneous ..	—	5,477.34	5,477.34
Photography/Typing ..	—	2,000.00	2,000.00
U.G.C. Project:			
Honorarium to Mr. D. N. Pant ..	—	10,000.00	10,000.00
Contingency ..	—	2,011.50	2,011.50

Income		Plan Rs.	Non-Plan Rs.	Total Rs.
Total B/F	..	18,23,430.10	55,19,403.92	73,42,834.02
Total	..	18,23,430.10	55,19,403.92	73,42,834.02

Expenditure	Plan Rs.	Non-Plan Rs.	Total Rs.
All India Coordinated Research Project on Ethnobiology:			
Research Fellowship ..	—	12,772.18	12,772.18
To Pay & Allowances ..	—	26,063.28	26,063.28
Travelling Allowance ..	—	7,230.15	7,230.15
D.S.T. Project: "Palaeobiology, Sedimentology & Stratigraphy"			
To Pay & Allowances ..	—	30,752.82	30,752.82
To Contractual Services ..	—	4,659.60	4,659.60
To Permanent Equipment ..	—	250.95	250.95
To Supplies & Materials ..	—	10,873.50	10,873.50
To Travelling Allowances ..	—	3,655.21	3,655.21
To Over head Charges ..	—	509.40	509.40
D.S.T. Project II : "Comparative Morphotaxonomy of Modern Algae of Kutch"			
Equipment ..	—	3,640.98	3,640.98
Contingencies ..	—	1,569.20	1,569.20
Balance to Lucknow University, Lucknow ..	—	6,789.82	6,789.82
Excess of Income over Expenditure ..	9,49,250.12	1,43,893.03	10,93,143.15
Grand Total ..	18,23,430.10	55,19,403.92	73,42,834.02

Auditor's Report

As per our report on the Balance Sheet of even date.

For R. N. Khanna & Co.,
Chartered Accountant

(Sd. R. N. Khanna)
Partner

Income		Plan Rs.	Non-Plan Rs.	Total Rs.
Total B/F	..	18,23,430.10	55,19,403.92	73,42,834.02
		18,23,430.10	55,19,403.92	73,42,834.02

(Sd. S. B. Verma)
Registrar
Birbal Sahni Institute
of Palaeobotany

(Sd. B. S. Venkatachala)
Director
Birbal Sahni Institute
of Palaeobotany

(Sd. T. N. Shukla)
Accountants
Birbal Sahni Institute of Palaeobotany

Birbal Sahni Institute

"Receipts and Payments for the

Receipts	Plan Rs.	Non-Plan Rs.	Total Rs.
To Opening Balance:			
Bank Account:			
Non-Plan Revenue Account ..	—	1,41,556.82	1,41,556.82
Plan Revenue Account ..	4,68,864.45	—	4,68,864.45
Plan Capital Account ..	3,45,550.98	—	3,45,550.98
Donation Account ..	—	3,720.88	3,720.88
Cash Account:			
Non-Plan Revenue Account	—	297.30	297.30
To Govt. of India Grants on Capital Account : ..	29,56,858.00	—	29,56,858.00
To Govt. of India Grants on Revenue Account :	13,50,460.00	48,47,146.00	61,97,606.00
To Govt. of U. P. Grant on Recurring Account:	—	5,000.00	5000.00
To Sale Proceeds of Publications:			
The Palaeobotanist ..	—	1,72,777.46	1,72,777.46
Monograph ..	—	300.00	300.00
Symposium ..	—	247.60	247.60
Catalogue ..	—	75.00	75.00
Aspects & Appraisal of Indian Palaeobotany ..	—	100.00	100.00
Seward Memorial Lecture ..	—	45.00	45.00
Birbal Sahni Mem. Lecture ..	—	24.00	24.00
Picture Post Cards ..	—	202.50	202.50
Silver Jubilee Mem. Lecture ..	—	12.00	12.00

of Palaeobotany, Lucknow

period from 1.4.1985 to 31.3.1986"

Payments	Plan Rs.	Non-Plan Rs.	Total Rs.
Capital Account:			
By Works and Building	4,51,969.68	—	4,51,969.68
By Research Apparatus and Equipment ..	9,88,384.31	—	9,88,384.31
By Equipment for Services Ancillary to Research:			
Library ..	1,60,906.89	—	1,60,906.89
Photography	35,128.68	—	35,128.68
C-14 Laboratory ..	2,82,863.60	—	2,82,863.60
Plant & Machinery ..	6,18,881.24	—	6,18,881.24
By Furniture and Fixtures:	3,29,499.80	—	3,29,499.80
By Vehicles	1,03,312.00	—	1,03,312.00
By Pay and Allowances:			
Pay (Academic) ..	57,684.72	8,46,619.46	9,04,304.18
Pay (Technical) ..	9,972.58	2,34,480.47	2,44,453.05
Pay (Administrative) ..	14,139.32	2,85,172.54	2,99,311.86
D. A. (Addl. D. A.) ..	1,12,918.40	17,44,679.06	18,57,597.46
House Rent Allowance ..	16,080.30	2,31,295.85	2,47,376.15
City Comp. Allowance ..	4,740.36	67,352.70	72,093.06
Interim Relief ..	16,869.10	2,67,602.58	2,84,471.68
Over Time Allowance ..	4,184.85	4,019.20	8,204.05
Medical Reimbursement ..	3,671.35	33,122.72	36,794.07
Reimbursement of Tuition Fee	—	391.50	391.50

Receipts	Plan Rs.	Non-Plan Rs.	Total Rs.
To Administrative Receipts:			
Income Tax ..	1,650.00	70,840.00	72,490.00
Insurance Premium (S. S. Sch.)	1,429.90	56,778.52	58,208.42
G. P. F. Subscription ..	23,896.00	5,87,326.00	6,11,222.00
Recovery of G. P. F. Advance	9,485.00	1,45,047.00	1,54,532.00
Recovery of B. S. I. P. Credit Cooperative Society ..	3,626.05	67,050.25	70,676.30
Pension Contribution ..	—	1,380.00	1,380.00
To Misc. Receipts and Recoveries :			
Application Fees ..	—	217.00	217.00
V. S. Room Rent ..	—	2,425.00	2,425.00
Telephone Charges ..	—	697.00	697.00
Vehicle Charges ..	—	—	—
Other Misc. Receipts ..	4,105.65	18,655.82	22,761.47
To Recoveries of Loans and Advances:			
Recovery of Festival Advance..	—	23,400.00	23,400.00
Recovery of Conveyance Advance ..	—	19,368.00	19,368.00
Interest of Conveyance Adv. ..	—	1,693.55	1,693.55
Recovery of House Building Advance ..	—	40,358.00	40,358.00
To Deposits :			
Security Deposits ..	47,116.65	—	47,116.65
To Donation and Endowments:			
Proceeds of Interest ..	—	7,431.75	7,431.75

Payments	Plan Rs.	Non-Plan Rs.	Total Rs.
Leave Travel Concession ..	16,313.60	27,848.05	44,161.65
Efficiency Bonus ..	75.00	1,720.16	1,795.16
Bonus ..	24,852.53	1,00,241.91	1,25,094.44
By Travelling Allowance:			
Governing Body & Selection Committee Meetings ..	—	9,841.10	9,841.10
For attending Meetings and Conferences in India ..	—	4,878.50	4,878.50
Funds for Training of staff in India ..	—	—	—
For other purposes ..	40,740.55	52,029.00	92,769.55
By Maintenance of Property:			
For Building ..	—	15,982.42	15,982.42
For Garden ..	—	5,078.51	5,078.51
For Equipment and Apparatus	39,575.92	—	39,575.92
For Vehicle ..	24,926.37	16,163.12	41,089.49
For Repairs and Renewals ..	8,560.51	12,887.42	21,447.93
By Contingencies:			
By Telephone and Trunk Call Charges ..	—	28,857.70	28,857.70
For Postage ..	—	43,600.00	43,600.00
For Advertisement ..	4,883.00	15,734.70	20,617.70
For Hot and Cold Weather Charges ..	2,200.00	20,090.00	22,290.00
For Petrol and Mobil Oil ..	5,117.88	10,040.14	15,158.02
For Electricity Charges ..	1,07,487.64	44,693.60	1,52,181 24
For Insurance of Vehicle and Library ..	—	5,354.00	5,354.00

Receipts	Plan Rs.	Non-Plan Rs.	Total Rs.
To Misc. Receipts on Capital Accounts:			
Interest earned in Savings Bank Account ..	—	24,212.88	24,212.88
O. N. G. C. Project:			
Opening Balance ..	—	3,722.90	3,722.90
Grant ..	—	32,969.24	32,969.24
Misc. Receipts/Refunds ..	—	2,538.00	2,538.00
Oil Industry Development Board Project:			
Opening Balance ..	—	(—) 16,083.36	(—) 16,083.36
Grant ..	—	1,30,000.00	1,30,000.00
U. G. C. Project:			
"Encyclopaedic Dictionary of Palaeobotany"			
Opening Balance ..	—	(—) 4,749.42	(—) 4,749.42
Grant ..	—	17,000.00	17,000.00
All India Coordinated Research Project on Ethnobiology:			
Opening Balance ..	—	6,404.70	6,404.70
Grant ..	—	50,200.00	50,200.00
D. S. T. Project-I :			
"Palaeobiology, Sedimentology ..... and Stratigraphy" ..			
Opening Balance ..	—	33,336.93	33,386.93
Grant ..	—	35,000.00	35,000.00
D. S. T. Project-II :			
"Comparative Morphotaxonomic.....Modern Algae of Kutch" ..			
Grant ..	—	12,000.00	12,000.00

Payments	Plan Rs.	Non-Plan Rs.	Total Rs.
For Liveries to Sub-Staff ..	—	17,313.20	17,313.20
For Printing and Stationery ..	70,055.39	54,312.34	1,24,367.73
For Railway Ft. and Carriage	—	4,750.30	4,750.30
For Custom Duty and Port Trust Charges ..	—	377.40	377.40
For Entertainment Allowance to Director ..	—	4,618.70	4,618.70
For Miscellaneous and Unforeseen ..	58,249.47	70,255.05	1,28,504.52
For Chemicals and Glasswares ..	1,76,600.87	1,13,932.51	2,90,533.38
For Library Requirements ..	—	32,178.31	32,178.31
For Museum Requirements ..	1,608.50	5,218.27	6,826.77
For Legal Advice ..	—	3,274.80	3,274.80
For Medical Advice ..	—	32.00	32.00
For Audit Fee ..	—	2,500.00	2,500.00
For Publications:			
The Palaeobotanist ..	—	41,604.32	41,604.32
For Annual Report ..	—	13,976.35	13,976.35
For Birbal Sahni Mem. Lect.	—	—	—
For Academic Expenses:			
For Field Excursion ..	78,087.64	47,808.02	1,25,895.66
For Birbal Sahni Mem. Lect.	—	500.00	500.00
For Sir A.C. Seward Mem. Lecture out of Donation A/c ..	—	2,118.95	2,118.95
Symposium and Seminar Co-sponsored and Participation	8,783.13	—	8,783.13

Receipts		Plan Rs.	Non-Plan Rs.	Total Rs.
Total B/F	..	52,13,042.68	65,40,724.32	1,17,53,767.00
Total C/o	..	52,13,042.68	65,40,724.32	1,17,53,767.00

Payments	Plan Rs.	Non-Plan Rs.	Total Rs.
By International Programmes:			
Air passage for members of staff proceeding on Foreign Fellowship or invited to attend Scientific Meetings and Conferences abroad (Deputation Abroad) ..	17,076.70	—	17,076.70
Honorarium for Visiting Scientists ..	—	—	—
By Welfare Expenses:			
Financial Assistance to Departmental Canteen ..	—	4,914.00	4,914.00
By G. P. F. Account:			
G. P. F. Subscription Transferred to G. P. F. A/c ..	23,896.00	5,87,326.00	6,11,222.00
Recovery of Advance transferred to G. P. F. A/c ..	9,485.00	1,45,047.00	1,54,532.00
G. P. F. Interest ..	—	—	—
Institute Contribution to C.P.F.	—	4,920.00	4,920.00
By Miscellaneous:			
Income Tax remitted ..	1,650.00	70,840.00	72,490.00
Insurance premium remitted (Salary Savings Scheme) ..	1,429.90	56,778.52	58,208.42
B. S. I. P. Co-operative Credit Society ..	3,626.05	67,050.25	70,676.30
B. S. Research Scholarship ..	—	39,586.71	39,586.71
B. S. Research Scholars (Contingency)	—	6,369.25	6,369.25
By Loans and Advances:			
Festival Advance ..	3,600.00	31,400.00	35,000.00
Conveyance Advance ..	—	27,900.00	27,900.00

Receipts		Plan Rs.	Non-Plan Rs.	Total Rs.
Total B/F	..	52,13,042.68	65,40,724.32	1,17,53,767.00
Total C/o	..	52,13,042.68	65,40,724.32	1,17,53,767.00

Payments	Plan Rs.	Non-Plan Rs.	Total Rs.
House Building Advance ..	2,73,560.00	67,110.00	3,40,670.00
Security Money Refunded to contractors ..	90,096.71	—	90,096.71
By Investments:			
Funds under Donation and Endowment Invested ..	—	5,687.50	5,687.50
By Pension and Superannuation:			
Pension, Family Pension and Gratuity etc. ..	—	5,24,431.83	5,24,431.83
Emeritus scientists ..	—	44,310.14	44,310.14
O. N. G. C. Project :			
Pay of Staff ..	—	5,505.00	5,505.00
D. A. & Addl. D. A. ..	—	8,884.00	8,884.00
House Rent Allowance ..	—	1,176.75	1,176.75
City Comp. Allowance .	—	353.04	353.04
Interim Relief ..	—	1,320.00	1,320.00
Chemicals and Glasswares ..	—	2,202.82	2,202.82
Misc. and Unforeseen ..	—	912.18	912.18
Oil Industry Development Board Project:			
Pay of Staff ..	—	29,137.16	29,137.16
D. A. and Addl. D. A. ..	—	46,922.60	46,922.60
House Rent Allowance ..	—	6,302.88	6,302.88
City Comp. Allowance ..	—	1,890.84	1,890.84
Interim Relief ..	—	7,239.98	7,239.98
Chemicals and Glasswares ..	—	—	—

Receipts		Plan Rs.	Non-Plan Rs.	Total Rs.
Total B/F	..	52,13,042.68	65,40,724.32	1,17,53,767.00
Total C/o	..	52,13,042.68	65,40,724.32	1,17,53,767.00

Payments	Plan Rs.	Non-Plan Rs.	Total Rs.
Travelling Allowance ..	—	10,027.80	10,027.80
Miscellaneous ..	—	5,477.34	5,477.34
Photography/Typing ..	—	2,000.00	2,000.00
U. G. C. Project:			
"Encyclopaedic Dictionary of.... .....Palaeobotany"			
Honorarium to Mr. D. N. Pant	—	10,000.00	10,000.00
Contingency ..	—	2,011.50	2,011.50
All India Coordinated Research Project on Ethnobiology:			
Research Associate/Fellow ..	—	12,772.18	12,772.18
Pay of Staff ..	—	8,680.00	8,680.00
D. A. and Addl. D. A. ..	—	12,570.80	12,570.80
House Rent Allowance ..	—	1,855.41	1,855.41
City Comp. Allowance ..	—	556.60	556.60
Interim Relief ..	—	1,708.00	1,708.00
Travelling Allowance ..	—	7,230.15	7,230.15
Bonus ..	—	692.47	692.47
D. S. T. Project:			
"Palaeobiology, Sedimentology.. .....and Stratigraphy"			
Salary of Staff ..	—	30,752.82	30,752.82
Contractual Services ..	—	4,659.60	4,659.60
Permanent Equipment ..	—	250.95	250.95
Supplies and Material ..	—	10,873.50	10,873.50
Travelling Allowance ..	—	6,755.21	6,755.21
Over Head Charges ..	—	509.40	509.40

Receipts		Plan Rs.	Non-plan Rs.	Total Rs.
Total B/F	..	52,13,042.68	65,40,724.32	1,17,53,767.00
Grand Total	..	52,13,042.68	65,40,724.32	1,17,53,767.00

BALANCE

	Bank	Cash	Total	
Plan :				
Central Recurring				
In Cash Book	6,20,814.42	—	6,20,814.42	
In Cash Book	84,482.72			
In S. B. Account	2,04,000.00	—	2,88,482.72	9,09,297.1
Central Non-Recurring				
Non-Plan :				
Central Recurring	6,412.47	408.55	6,821.02	
Donation and Endowment	3,346.18	—	3,346.18	
Projects:				
O. N. G. C.	18,876.35	—	18,876.35	
Ethnobiology	10,539.09	—	10,539.09	
D. S. T. (Palaeobiology.... Stratigraphy)	14,535.45	—	14,535.45	
D. S. T. (Comparative.... Kutch)	—	—	—	
U. G. C.	239.08	—	239.08	
O. I. D. B.	4,918.04	—	4,918.04	59,275.21
				9,68,572.35

Payments	Plan Rs.	Non-P lan Rs.	Total Rs.
D. S. T. Project-II: "Comparative Morphotaxonomic .....Modern Algae of Kutch"			
Equipment ..	—	3,640.98	3,640.98
Contingencies ..	—	1,569.20	1,569.20
Balance transferred to Lucknow University, Lucknow ..	—	6,789.82	6,789.82
Total ..	43,03,745.54	65,33,449.11	1,07,85,194.65

(Sd. S. B. Verma)
Registrar
Birbal Sahni Institute of Palaeobotany

(Sd. T. N. Shukla)
Accountant
Birbal Sahni Institute of Palaeobotany

(Sd. B. S. Venkatachala)
Director
Birbal Sahni Institute of Palaeobotany

Auditor's Report

As per our report on the Balance Sheet of the even date :

For R. N. Khanna & Co.
Chartered Accountant

(Sd. R. N. Khanna)
Partner

Place: Lucknow