ANNUAL REPORT
1984-85

BIRBAL SAHNI
INSTITUTE OF PALAEOBOTANY
LUCKNOW

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Introduction

The Institute conducts research on the varied aspects of plant fossils, both applied and fundamental. The research activities at the Institute are organised under various departmental, inter-departmental and collaborative projects in eleven departments. Besides, some sponsored projects have been taken up.

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

Acritarchs have been reported for the first time from the Blaini-Krol-Tal formations exposed at Maldeota, which enabled the possibilities of recognising different geological units in the area. An arthrophyte, *Lelstotheca* Maheshwari, known hitherto from the Barakar Formation of the Bansloi Valley Coalfield, has been recorded from the Raniganj Coalfield. A Rhodophycean alga, *Lithophyllum*, has been described from the Deccan Intertrappean beds exposed at Mohgaon Kalan in Madhya Pradesh, which provides further evidence of marine conditions in the area during the early Tertiary. On the basis of palynostratigraphy various events and episodes of vegetational and climatic developments have been recorded since 30,000 yrs B.P. at Colgrain in South India. Three distinct phases of vegetational developments, viz., between 11,500 to 8,050 yrs B.P., between 6,750 to 5,010 yrs B.P., and between 1,200 B.P. to present have been established at Bastua, Chhui Stream and Amgaon in Madhya Pradesh. An assemblage of Pali Formation having Raniganj type of affiliation, and another assemblage at Lower Parsora Formation showing Raniganj/Panchet transitionary phase have been recognised. It has been observed that the *Striatopodocarpites*, *Crescentipollenites*, *Densipollenites*-suite changes for *Striatopodocarpites*, *Klausipollenites*, *Lunatisporites*-suite at the Permo-Triassic boundary level and this

continental sequence unveiled a complete picture for the Permo-Triassic boundary for the first time.

A new trilete-bearing reticulate miospore genus has been described from the Triassic sediments of Rajmahal Hills. *Striatriletes* has been reported for the first time from the Prang Limestone (Middle Eocene) in north-east India. On the basis of palyno-stratigraphy a Palaeocene age has been assigned to the Sutunga assemblage, Meghalaya. Based on the recovered palynoflora, the age of the Jadukata Formation is assigned as Upper Albian-Cenomanian and of the Mahadek Formation as Turonian. The Upper Eocene beds of Surat area have been precisely dated for the first time. The study of West Bokaro coals reveals that in highly disturbed basin, owing to the fluctuating hydrological conditions, climatic and tectonic set up, four varied genetic coal types were formed irrespective of time and space. The presence of coal-balls in the Garu Formation indicates that the sediments were deposited in shallow marginal swamps. A new monolete miospore, *Navalesporites*, has been reported from the Pathakhera Coalfield. Fission-Track dates show that the formation of pellet limestone in the Lower Vindhyan at Chitrakut, Banda District started around 1,200 Ma and ended around 1,120 Ma ago.

Recently a Scanning Electron Microscope has been commissioned at the Institute and investigation of ultrastructure of surface features has been initiated.

Under a special programme "Palaeobotany for Education" a number of fossil specimens and slides have been sent by the Museum to a number of colleges and universities in India and abroad. The objective of this programme is to generate interest in palaeobotanical findings, mainly among the students graduating in botany and geology.

Governing Body

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Assistant Secretary (Non-Member)
Shri Gurcharan Singh, Registrar,
Birbal Sahni Institute of Palaeobotany,
Lucknow 226 007

Honours and Awards

Jaswant S. Guleria	..	Awarded the 'Iyengar-Sahni Prize' for the year 1984 for the best paper published in 'The Palaeobotanist' during the last two years.
Rama S. Singh	..	Awarded the degree of Doctor of Philosophy for his work, "Contribution to the Mesozoic Palaeobotany of India" by the Lucknow University.
Ramesh K. Saxena	..	Elected Life Fellow of the Indian Society of Geoscientists.
Surya K. M. Tripathi	..	Elected Fellow of the Indian Society of Geoscientists.
Vinay K. Singh	..	Awarded the degree of Doctor of Philosophy for his work, "Studies in morphology of woody plants —Lower Gondwana woods" by the Allahabad University.

Representation in Committees/Boards

Anand Prakash	..	Treasurer, Indian Association of Palynostratigraphers.
Garud K. B. Navale	..	Member, International Committee for Coal Petrology.

	..	Member, International Sub-Committee on Gondwana Coal I.C.C.P.
	..	Member, International Commissions on Coal and Lignite Nomenclature and Analysis.
	..	Member, International Commissions on A.C.P.G. & A.C.P.I.
	..	Member, Indian National Working Group for I.C.C.P. Project No. 106 on Global correlation of coal.
	..	Member, Editorial Board, "Coal Geology".
	..	Vice-President, Coal Petrological Society of India.
Govindraja Rajagopalan	..	Member, Executive Council, The Palaeobotanical Society.
Hari K. Maheshwari	..	Member, Committee for Fossil Plants, International Association for Plant Taxonomy.
	..	Member, Principal Working Group for proposed IGCP Project 'Pre-cambrian to Tertiary floras of Gondwanic continents'.
	..	Editor, Indian Association of Palynostratigraphers.
Hari P. Gupta	..	Business Manager, Indian Association of Palynostratigraphers.

Hari P. Singh	..	Secretary, The Palaeobotanical Society, Organising Secretary, VI Indian Geophytological Conference.
	..	Editor, 'The Palaeobotanist'.
	..	Member, Editorial Board, 'Geophytology'.
	..	Regional Representative of India, International Organisation of Palaeobotany.
Jagannath P. Mandal	..	Joint Editor, Vanaspatik Club Newsletter, Lucknow.
Jaswant S. Antal	..	Editor, "Geophytology".
Krishna Ambwani	..	Joint Secretary, The Palaeobotanical Society.
Krishna P. Jain	..	Member, Asssociation des Palynologues de langue Francaise, France.
	..	Secretary, Indian Association of Palynostratigraphers.
	..	Member, Palaeontological Society of India.
Kripa S. Saraswat	..	Editor, "Geophytology"
Nilambar Awasthi	..	Editor, "Geophytology" (till December, 1984).
Prabhat K. Maithy	..	Member, Editorial Board, 'Geoviews'.

	..	Joint Secretary, Organising Committee, II Aerobiological Conference.
	..	Member, Organising Committee, VI Indian Geophytological Conference.
Rajendra N. Lakhanpal	..	Chief Editor, "The Palaeobotanist" (till 31st August, 1984).
	..	Member, Editorial Board, Proceedings of the Indian National Science Academy, Part B (Biological Science).
	..	Member, Executive Committee, International Association for Angiosperm Palaeobotany.
Ram S. Tiwari	..	Chief Editor, "Geophytology" till December, 1984).
	..	Chief Editor, "Vanaspatik Club Newsletter".
	..	Member, Executive Committee, Palaeontological Society of India.
	..	Vice-President, Indian Association of Palynostratigraphers.
	..	Member, Organising Committee for the II All India Conference on Aerobiology.
	..	Vice-President, International Association of Applied Biology.

Ramesh K. Saxena	..	Secretary, Indian Society of Geoscientists.
Ranajit K. Kar	..	Joint Secretary, Organising Committee, VI Indian Geophytological Conference.
	..	Founder Member, Indian National Earth Sciences Academy, Calcutta.
	..	Treasurer, Vanaspatik Club, Lucknow.
Sayed A. Jafar	..	Editor, "The Palaeobotanist".
Sukh Dev	..	Treasurer, The Palaeobotanical Society.
	..	Member, Editorial Board, 'Geophytology'.
Suresh C. Srivastava	..	Editor, "Geophytology" (till December, 1984).
	..	Editor, "The Palaeobotanist".
Uttam Prakash	..	Regional Representative for India, International Association for Angiosperm Palaeobotany.
	..	Member, Sigma XI, Harvard Chapter, U.S.A.
	..	Chief Editor, "The Palaeobotanist".

Research

Department of Non-Vascular Plants

Project : *Palaeobiology of Vindhyan Supergroup and its equivalents*

Objective : *Study of biological remains during Precambrian and Cambrian to understand the evolution and diversification of life*

Observations on the biological remains from the Semri and Kaimur groups exposed around Chopan have been completed and a paper on the studies was finalized. This includes the evolution and diversification of life during Vindhyan. The role of biological remains in biostratigraphy has also been discussed in it.

Another paper on the role of biological remains in mineralisation of limestone, carbonaceous shale and glauconitic beds was also finalized.

P. K. Maithy and Rupendra Babu

Remains of acritarch, Cyanophyceae and multicellular sheaths have been recorded from the Bhander Group of Chakghat-Rewa sections. Besides, organosedimentary structures, stromatolites and catagraphs have been recorded indicating shallow conditions during deposition. The presence of multicellular sheaths indicates the possibility for the presence of terrestrial non-vascular plants.

P. K. Maithy and Bijai Prasad

Observations on the microbiota comprising Cyanophyceae and acritarch from the Semri, Rewa and Bhander groups of Vindhyans exposed around Satna and Maihar areas were completed. The acritarch assemblage shows the characteristic presence of operculate form *Vindhyasphaeridium*. The overall assemblage is characterised by the presence of Sphaeromorphitae acritarch. Among algae, the occurrence of the genus *Vetronostocale* is interesting.

P. K. Maithy and K. L. Meena

The samples collected from Ghat-Pithoragarh, Pithoragarh-Chandak sections and around Marh for microbiota studies were macerated and it has been observed that the yield and preservation of the biotic entity is poor.

Manoj Shukla

The acritarch recovered for the first time from the Blaini-Krol-Tal formations exposed at Maldevata were studied. Further observations based on the acritarch reveal the possibility of recognising different geological units. A paper on the acritarch from the phosphorite beds belonging to Lower Tal was submitted for publication.

Bijai Prasad and P. K. Maithy

A paper on the biological remains from the Precambrian-Cambrian of India was finalized. In this paper remarks have been made on the identified biological remains especially regarding their biogenicity and synsedimentary deposition.

P. K. Maithy

Project : Fossil algae from the Cretaceous-Tertiary of South India

Objective: Morphotaxonomical study of fossil algae

A paper entitled "Fossil algae of Varagur, Tiruchirapalli' was finalized and submitted for publication. In this paper the morphology and palaeoecology of algae have been given in detail.

P. K. Misra and Pramod Kumar

Observations on the Tertiary algae from Sendurai and Matur areas were carried out, which revealed the presence of large assemblage of vegetative and fertile calcareous algal remains, in which tetrasporangial complexes of the genera—*Lithothamnium*, *Mesophyllum* and *Lithophyllum* are interesting. Red algal attachment with corals are being studied.

P. K. Misra

Vegetative thalloid bodies of *Solenopora* and *Amphiros*, etc. from Olipaidi and *Parachaetes* and *Thaumatoporella* from Asavirankudikudd and Sendurai areas have been reported.

Pramod Kumar

Project : Study of fungi from the Miocene of Kerala Coast

Objective: To study taxonomy of fungal spores and their implications in palaeoenvironment

In all, 26 genera of fungal remains were recorded, out of which 15 taxa are comparable to the modern taxa which are found in tropical humid and heavy precipitated climate.

Pramod Kumar

Project : Palaeobiology, sedimentology and dating of Vindhyans around Rohtas with a bearing on mineralisation and stratigraphy

Objective: To study the biological remains, organosedimentary structures, petrology of rocks and to carry out heavy mineral analysis and dating of rocks by fission-track method

It has been observed that in the south-eastern part of basin the Amarkha Sandstone lies unconformably over the Bijawars, whereas in the south-western part the Amarkha Sandstone lies conformably over a fawn coloured stromatolitic bed. Stromatolite has been reported for the first time from the Rohtas Limestone Formation. Besides, several disc-shape remains have been recorded from this formation, which compare with *Chuaria*. Lithologs of the geological sequences exposed around Amjohre, Arjunpahar, Murlipahar, Rohtas Fort, Baulia and Nauhatta have been drawn. Some glauconite and quartzite samples of the Lower Vindhyan sediments are being processed for Fission-Track dating.

P. K. Maithy, Kedar Narain, Govindraja Rajagopalan
A. P. Srivastava, Rabi Misra and Amar Sarkar

Project : Comparative morphotaxonomy and ultrastructural and palaeoecological studies of modern and Tertiary algae of Kachchh and Gujarat

Objective: Detailed study of fossil algae and to explore the palaeoecological environments during deposition

Detailed study of modern and fossil algae has been undertaken. However, preliminary observations reveal the presence of *Lithophyllum* and *Corralina*.

P. K. Misra

Department of Palaeophytic Evolutionary Botany

Project : Resolution of gymnosperms and pteridophytes in the Glossopteris Flora

Objective: To investigate morphology, taxonomy and evolutionary trends of the component taxa of the Glossopteris flora and also to plot their stratigraphical and geographical distribution

A report on morphological investigations of *Glossopteris* leaves from the Upper Permian exposures near Handappa, Dhenkanal District, Orissa is being finalized. Observation, description, comparison and line drawings were completed for 25 species after studying about 350 specimens. The newly instituted species are: *G. kamthiensis, G. maheshwari, G. attenuata, G. utkalensis, G. hinjridaensis, G. inequalis* and *G. dhenkanalensis*. Other species which have been finalized are: *G. leptoneura, G. indica, G. communis, G. retifera, G. conspicua, G. tortuosa, G. arberi, G. vulgaris, G. varia, G. zeilleri, G. subtilis, G. spatulata, G. gigas, G. gondwanensis, G. tenuinervis, G. nautiyalii, G. obscura* and *G. sastrii*. A correlation chart showing occurrence of each species in different Lower Gondwana formations of India has been prepared. The plant megafossil assemblage from Handappa was found resembling most of the Raniganj-Kamthi assemblage; 28 species being common. *G. indica*

is the most common species while *G. angustifolia* and *G. tenuifolia* are subdominant species.

K. J. Singh and Shaila Chandra

Belemnopteris duocaudata comb. nov. has been identified and described from the Upper Permian of Handappa, Orissa. A paper on the same has been completed.

Shaila Chandra and K. J. Singh

An introduction and description of few genera of fructifications from Handappa under revision have been written. A short note on the male genus *Nesowalesia* has been prepared.

Shaila Chandra

A new genus, *Gondwanophyllites*, has been instituted for certain leaves showing a dissected margin, reticulate venation and emarginate apex collected from coal seam B4 in the West Raniganj Coalfield. On this study a paper has been finalised. Morpho-cuticular investigations of 10 species of the genus *Glossopteris* collected from the Barakar Formation of West Raniganj Coalfield have been completed. Observation and description of pteridophytic mega-remains from the Lower Barakar of Palasthali area, Raniganj Coalfield were continued.

A. K. Srivastava

The arthrophyte *Lelstotheca* Maheshwari, known so far only from the Barakar Formation of Bansloi Valley Coalfield, Bihar has been found in the Barakar Formation of Raniganj Coalfield. The genus is represented by two species, viz., *L. robusta* (Feistmantel) Maheshwari and *L. striata* sp. nov. The new species is characterised by the presence of interconnecting striations running parallel to the median vein of the leaves. The taxonomic position of the genus and its records elsewhere have also been discussed in the paper.

H. K. Maheshwari and A. K. Srivastava

Arthophytes collected from the carbonaceous shale bed of Lalmatia Open Cast Project, Rajmahal Hills, Bihar have been investigated. These include *Lelstotheca*, equisetalean axes and two species of the genus *Sphenophyllum*. Leaves of one of the species show dentate apical margin and heterophylly, the latter character is being reported for the first time in the Glossopteris Flora of India. It has been found that *Trizygia speciosa*, commonest sphenopsid in Glossopteris Flora, is conspicuously absent in the Lalmatia assemblage.

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

The work on monographic revision of the fossil flora of Raniganj Formation was continued. About 500 hand specimens were sorted from 2 collieries and catalogued under the genera *Neocalamites, Raniganjia, Trizygia, Dichotomopteris, Dizeugotheca, Trithecopteris, Glossopteris, Palaeovittaria, Rhabdotaenia* and *Pteronilssonia.*

A number of fertile fern fronds collected from the Raniganj Formation of Raniganj Coalfield have been photographed. They have been provisionally catalogued under the genera *Neomariopteris, Dizeugotheca, Dichotomopteris, Damudopteris* and *Trithecopteris.* Techniques are being developed to prepare ultrathin sections of sporangia and spores of these ferns.

Gymnospermous leaves, other than those belonging to the genus *Glossopteris*, collected from the Raniganj Formation have been photographed. Cuticular preparations have been made from a few newly collected specimens of the genera *Palaeovittaria, Rhabdotaenia* and *Pteronilssonia.*

H. K. Maheshwari and Usha Bajpai

A paper on a new species of the genus *Glossopteris—G. shailae*— from the Kumarpur Sandstone Member, Raniganj Formation, Raniganj Coalfield was submitted for publication. The species is characterised by an evanescent midrib and typical cuticular features.

Another paper on a gangamopterid leaf from the Raniganj Formation, Raniganj Coalfield was also submitted for publication. The cuticular features of the leaf closely resemble those of *Glossopteris intermittens* Feistmantel and *Palaeovittaria kurzii* Feistmantel.

Usha Bajpai

A paper on the 'SEM study of megaspore sporoderm of some Indian Selaginellas' has been submitted for publication. The surface ornamentation and fine structure of sporoderm wall in fracture sections of five species of the genus *Selaginella* have been studied under the scanning electron microscope. The major surface ornamentation in all the species consists of randomly distributed protuberances of varied size and shape. The surface between the protuberances is studded with microvilli and/or micropits. The fracture sections show a two-layered sporoderm, both layers showing discrete, randomly arranged sporopollenin units in 3-dimensional view.

Usha Bajpai and H. K. Maheshwari

A number of specimens from the Barakar Formation of Raniganj Coalfield, representing some 15 species of the genus *Glossopteris*, have been investigated for morphography and cuticular features. Twenty one specimens have yielded cuticle, though usually it is very fragile. Photographs of morphological and anatomical details of the specimens have been taken and 36 line drawings of leaves and 60 photo-tracings of cuticular features have been prepared.

Rajni Tewari and H. K. Maheshwari

Project : Palaeozoic from abroad

A number of samples from the Permian of Zaire (Former Belgian Congo) were processed for megaspores. Only one sample showed good recovery. Megaspores are being prepared for ultrastructural studies.

H. K. Maheshwari and Usha Bajpai

Study of some of the doubtful species of *Glossopteris* from Australia was finalised.

Shaila Chandra and J. F. Rigby

Project : Palynostratigraphy of the Mesozoic sediments of the Kachchh Basin

Objective: To establish palynostratigraphy in Kachchh Basin

Writing of the monograph on Mesozoic spores and pollen from the Kachchh Basin was completed, except for the discussion part. The manuscript finalised so far comprises about 300 odd pages of typescript and includes Introduction, Material and Methods, Taxonomy, Descriptions, Explanation of plates (about 28) and Bibliography.

The Jhurio and Jumara formations did not yield pollen and spores except some badly preserved *Araucariacites* grains.

The Lower and Middle members of the Jhuran Formation exposed in Jhuran River and the Upper Member exposed in a well near Ugedi, the Rudramata Shale Member of Khari River, Chawad River and Sukhpur Nala have yielded a good assemblage dominated by *Araucariacites*-complex. Pteridophytic spores are relatively uncommon and include *Cyathidites, Deltoidospora, Todisporites, Biretisporites, Dictyophyllidites, Concavissimisporites, Klukisporites, Impardecispora, Pliosisporites, Contignisporites,* etc.

The Bhuj Formation assemblage, too, is dominated by the *Araucariacites*-complex. The assemblage from Korawadi River, Gadhsisa, Pur River and Jamthara is hardly different from that of the Jhuran Formation. However, two sections, one near Trambau-on-Pour and other in Rukmavati River do show significant amounts of pteridophytic spores. The Bhuj assemblage is basically differentiable by the presence of genera such as *Impardecispora* (up to 20%), *Cyathidites* (up to 16%), *Bhujiasporites* (up to 10%), *Aequitriradites* (up to 9.5%), *Cicatricosisporites, Densoisporites, Cooksonites* (up to 12%), *Neoraistrickia* (up to 7%), etc.

H. K. Maheshwari and B. N. Jana

The paper on megaspores from the Mesozoic of Kachchh Basin was finally completed and sent for publication. The assemblage includes 11 genera and 27 species. The overall assemblage, however, is indicative of Lower Cretaceous age.

Jayasri Banerji, B. N. Jana and H. K. Maheshwari

The paper on Jurassic dinoflagellates from the Kachchh Basin was also submitted for publication. The dinocyst assemblage comprises 31 species referable to 24 genera and shows an Upper Oxfordian to Kimmeridgian age, probably extending to *P. pectinatus* zone.

K. P. Jain, B. N. Jana and H. K. Maheshwari

Department of Mesophytic Evolutionary Botany

Project : *Middle Upper Triassic floras of India*

Objective : *To carry out morphological studies of Middle to Upper Triassic floras of India and their botanical and stratigraphical significance*

Investigations on the Triassic flora from Nidpur were continued in which more diverse type of fructifications have been found. Detailed study of two more cone genera has been completed.

S. C. Srivastava

Out of a number of seeds collected from the shales of Nidpur, eight new genera of seeds have been identified. Their detailed description and comparison have partly been written. These genera were identified on the basis of characters of integument, nucellus and micropyle. Besides, the prints of seeds exposed on the rock surface have also been taken.

S. C. Srivastava and S. R. Manik

Project : *Fossil flora from the Jurassic-Lower Cretaceous of Rajmahal Hills, India*

Objective : *To carry out morphological and anatomical studies of the fossil plants from the Rajmahal Hills and to find out their botanical and stratigraphical importance*

Revision of the Indian *Williamsonia* was continued. Descriptions of a few species and a brief historical review of the work done so far have been written.

M. N. Bose, Jayasri Banerji and P. K. Pal

Project : *Morphological and cuticular studies of fossil plants from the Jabalpur Formation of Madhya Pradesh*

Objective : *To carry out detailed studies on the fossil flora of Jabalpur Formation from botanical and stratigraphical view points*

Several specimens of *Cladophlebis*, *Ptilophyllum*, *Elatocladus*, *Araucarites* and *Satpuria* were photographed and text-figures of some Cycadophytes and conifers were prepared. Further work was continued.

Sukh Dev and Neeru Pandya

Project : *Fossil flora from the Lower Cretaceous of South Rewa Gondwana Basin*

Objective : *To carry out morphological and cuticular studies*

Descriptions and comparisons of *Phlebopteris polypodioides*, *Matonidium indicum*, *Weichselia reticulata*, *Cladophlebis medlicottiana*, *C. kathiawarensis*, *C. daradensis*, *C.* sp. cf. *T. indicus* and species of *Sphenopteris* were rewritten. Photographs and text-figures of some species of *Cladophlebis*, *Sphenopteris*, *Adiantopteris* and *Brachyphyllum* have been prepared. Further work was continued.

M. N. Bose, Sukh Dev and Rashmi Srivastava

Project : *Fossil flora from Kachchh-Kathiawar and Rajasthan*

Objective : *To investigate the fossil flora from the Mesozoic of Kachchh-Kathiawar and Rajasthan and its bearing on stratigraphy of the region*

A paper 'Fossil plant remains from Sarnu, Barmer District, Rajasthan' was completed and submitted for publication. The assemblage includes the genera *Phlebopteris*, *Cladophlebis*, *Pachypteris*, *Otozamites*, *Brachyphyllum* and *Pagiophyllum*.

Jayasri Banerji and P. K. Pal

Recently collected specimens of *Isoetes* and a new bryophyte *Trambauathallites* n. gen. are being investigated. The specimens have been photographed.

Jayasri Banerji

Project : *Fossil floras from the Mesozoic rocks of Pranhita-Godavari Valley*

Objective : *To study the Mesozoic floras of the area and their importance in stratigraphy*

Sections of about 40 silicified woods from Kota have been prepared and examined and some more anatomical variations in these species have been observed. From Gangapur Formation species of *Ptilophyllum* and *Pachypteris* have been studied.

Sukh Dev and Annamraju Rajnikanth

Project : *Fossil floras from the East Coast of India*

Objective : *To investigate the Mesozoic floras from East Coast and to determine their role in stratigraphy*

Descriptions of various species belonging to *Equisetites*, *Cladophlebis*, *Sphenopteris*, *Bucklandia*, *Elatocladus* and *Araucarites* from

Cuttack area have been written and about 45 specimens of pteridophytes and conifers have been photographed.

Sukh Dev and Neeru Pandya

Various species of *Equisetites*, *Taeniopteris*, *Ptilophyllum* and *Elatocladus* from the Terani beds were described.

Sukh Dev and Annamraju Rajnikanth

Department of Cenophytic Evolutionary Botany

Project : *Studies on the Deccan Intertrappean flora of India*

Objective : *To explore new exposures of the Deccan Intertrappean Series and study the plant fossils in detail to unravel the Early Tertiary vegetation and climate*

A paper entitled, "Occurrence of *Lithophyllum* in the Deccan Intertrappean beds of Mohgaon Kalan, Chhindwara District, Madhya Pradesh" was finalized. The presence of this rhodophycean alga has provided further evidence of marine conditions near Mohgaon Kalan in Chhindwara District of Madhya Pradesh during the Early Tertiary.

Another paper entitled "Fossil wood resembling *Canarium-Bursera-Garuga* from the Deccan Intertrappean beds of Mandla District, Madhya Pradesh with revision of the genus *Canarioxylon* Prakash, Brazinova & Awasthi" was also finalized.

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

A paper entitled "Fossil wood of *Gmelina* Linn. (Verbenaceae) from the Deccan Intertrappean beds of Nawargaon with comments on the nomenclature of Tertiary fossil woods" was finalized and submitted for publication.

M. B. Bande

Detailed study of a monocotyledonous infructescence *Viracarpon hexaspermum* Sahni was taken up. The study is expected to throw new light on the structure and affinities of this interesting fossil.

M. B. Bande and Nilambar Awasthi

The detailed studies of megafossils from the Mandla District was compiled in the form of a thesis entitled, "Further contributions to the knowledge of the Deccan Intertrappean flora of India". A few incomplete leaf impressions studied and assigned to the genera *Dicotylophyllum* and *Poacites* were also included in this thesis.

R. C. Mehrotra

A fossil palm peduncle from the Intertrappean beds of Nawargaon, Wardha District was described as *Palmostroboxylon wardhaensis* and a paper was finalized. To resolve the genus *Palmoxylon*, detailed anatomical studies of a complete stem of *Trachycarpus martiana* H. Wendl. were carried out and a paper was submitted for publication. Detailed anatomical study of the fruit of *Caryota* was undertaken for the identification of fossil palm fruits. The sections of fruit were also subjected to the SEM studies.

In order to ascertain the affinities of fossil monocots (other than palms) cross and longitudinal sections of *Dracaena* were prepared and studied The sections were also subjected to SEM studies.

About 25 sections of fossil palm stems collected from different localities of the Deccan Intertrappean Series, viz., Mohgaon Kalan, Shahpura and wardha, were prepared and polished for fission-track studies to ascertain their age. Besides, a comparative study of different types of crystals occurring in fossil and living monocots has been undertaken.

Krishna Ambwani

Project : *Investigation of the Tertiary plants of western India*

Objective : *To build up a floristic succession for the study of palaeo-environment and plant migration in the region*

Detailed investigation of a number of fossil woods from the Tertiary of Rajasthan and Gujarat has been taken up. Some of them were identified as belonging to the families Dipterocarpaceae, Sterculiaceae, Leguminosae and Combretaceae.

J. S. Guleria

Project : *Studies on the Tertiary plants of South India*

Objective : *Study of fossil woods and other plant remains from the Neogene of South India to unravel the vegetational complexes, palaeoecology and phytogeography of this region*

Some more petrified woods from the Cuddalore Series near Pondicherry were identified with the Malayan Dipterocarps, viz., *Shorea*, *Anisoptera* and a Burmese Myrtaceous wood, *Tristania burmanica*. Two papers on these Dipterocarps and Myrtaceous woods are being prepared. Another paper entitled, "a fossil wood resembling *Xanthophyllum* from the Cuddalore Series near Pondicherry" was submitted for publication. In addition, some more pieces of petrified woods from the same locality were studied and their identification with the modern taxa is being ascertained.

Systematic studies of carbonised woods from the Neogene of Kerala Coast collected from Varkala, Padappakara, Payangadi, Meenkunnu and Cheruvathur were continued. Some of these with satisfactory preservation were identified with the woods of Dipterocarpaceae, Anacardiaceae, Sapindaceae, Rutaceae, Leguminoceae, Lecythidaceae, Ebenaceae and Sapotaceae. A paper on a wood resembling *Barringtonia* is being written.

Nilambar Awasthi

Investigation of carbonised woods from the Neyveli lignite mine-I was continued. A paper describing a carbonised woods

resembling the Rubiaceous genera, viz., *Canthium, Randia, Tricalysia* and *Xeromorphis* was finalised. Out of a large number of carbonised woods, a few seem to belong to the family Sapindaceae, Anacardiaceae and Leguminosae. To ascertain their affinities with the extant genera their further study was continued.

Several specimens of a monocotyledonous axis bearing spirally arranged leaves and leaf-scars were studied and provisionally identified as belonging to the family Pandanaceae. The cuticular preparation of these fossil leaves were made.

In order to identify the fossil leaves recovered from the Neyveli lignite leaf cuticles of some species of *Diospyros, Garcinia, Hopea, Shorea, Rhus* and *Semecarpus* were prepared and studied.

Nilambar Awasthi and Anil Agarwal

Project : *Studies on the plant fossils from the Himalayan foot-hills*

Objective : *To build up a floristic succession of the Siwalik Group*

A paper entitled, "Some more fossil woods from the Siwalik beds of India with remarks on the floral evolution and climatic changes during the Siwalik period" was submitted for publication.

Uttam Prakash and R. R. Yadav

Two fossil woods collected from the Lower Siwalik beds of Kalagarh were identified with the woods of *Ormosia robusta* of Leguminosae and *Tristania conferta* of Myrtaceae respectively. Their description and photography were also completed.

Mahesh Prasad

A draft manuscript, 'A new fossil wood of *Shorea* from the Lower Siwalik beds of Kalagarh, Uttar Pradesh' was written.

Uttam Prakash and Mahesh Prasad

Fourteen more leaf-impressions collected from the Lower Siwalik beds of Koilabas, Nepal were identified with the modern

leaves of *Dipterocarpus tuberculatus*, *Ryparosa kunstleri*, *Chloroxylon switienia*, *Millettia macrostachya*, *Dalbergia sericeae*, *Ormosia robusta*, *Albizia gamblei* (syn. *A. lebbek*), *Terminalia pyrifolia*, *Lonicera quinquelocularis*, *Diospyros toposia*, *Gaertnera bieleri*, *Vitex negundo*, *V. pubescence* and *Cinnamomum inuctum*. A paper dealing with four leaf-impressions showing close resemblance with the modern leaves of *Dipterocarpus tuberculatus*, *Ormosia robusta*, *Albizia gamblei* and *Millettia macrostachya* was finalized.

Uttam Prakash and Mahesh Prasad

Compilation of the work on fossil woods from Kalagarh, Uttar Pradesh and leaf-impressions from Koilabas, Nepal in the form of a thesis entitled, "Studies on the plant fossils from the Siwalik Group" was taken up.

Mahesh Prasad

A number of leaf-impressions collected from the Lower Siwalik beds of Oodlabari near Siliguri were investigated. Some well-preserved specimens were described, photographed and their text-figures made. Some of them have been tentatively identified with the genera *Mesua* and *Calophyllum* of Guttiferae, *Dalbergia* of Leguminosae, *Dillenia* of Dilleniaceae and *Syzygium* of Myrtaceae.

J. S. Antal and Uttam Prakash

Work on the leaf-impressions from the Lower Siwalik beds near Tanakpur was continued. More leaf-impressions were photographed and preliminary observations made. In all, there are about 50 recognisable types of species and some of them were provisionally identified with the extant genera belonging to the family Rhamnaceae, Leguminosae, Euphorbiaceae, Sterculiaceae, Combretaceae, Lauraceae, Ebenaceae, Sapotaceae, Rubiaceae, etc.

R. N. Lakhanpal and Nilambar Awasthi

A draft manuscript on the leaves of *Dipterocarpus* from the Lower Siwalik beds of Balu-Goloa in Himachal Pradesh was prepared.

R. N. Lakhanpal and J. S. Guleria

Project : *Investigation of the Tertiary plant magafossils of north-eastern India*

Objective : *To build up Tertiary vegetation of north-eastern India*

About 70 specimens of leaf impressions collected from the Palaeocene of Cherrapunji, Meghalaya were cleared. Out of these, 20 specimens were tentatively identified with the genera belonging to Moraceae, Apocynaceae, Myrtaceae and monocotyledons.

Krishna Ambwani

A large number of leaf-impressions collected from the Palamau District, Bihar were cleared and studied. A number of new types were selected, photographed and their description written.

M. B. Bande and G. P. Srivastava

The study of some more fossil woods collected from the Tertiary of Bengal and Bihar has been taken up and some of them belong to new taxa.

Uttam Prakash and G. P. Srivastava

Several pieces of woods from the Namsang beds near Deomali, Arunachal Pradesh were studied, out of which only a few have been found new for the area. Their affinities with the modern taxa are being ascertained. A paper on the 'Fossil woods of *Bischofia* and *Antiaria* from the Namsang beds of Deomali, Arunachal Pradesh with critical remarks on fossil woods referred to *Bischofia*' was finalized.

Nilambar Awasthi and Uttam Prakash

A draft manuscript on nine fossil dicotyledonous woods resembling the extant genera, viz., *Shorea*, *Gluta*, *Euphoria*, *Cassia*, *Cynometra*, *Albizia*, *Sindora*, *Afzelia-Intsia* and *Terminalia* from the Lower Siwalik beds of Siang and Subansiri districts, Arunachal Pradesh is being written.

Nilambar Awasthi

Seven fossil woods from the Tipam Series of Assam and Nagaland were identified with the woods of *Elaeocarpus*, *Echinocarpus*, *Ganophyllum*, *Canarium*, *Gluta*, *Millettia-Pongamia*, *Terminalia* and *Lagerstroemia*. A draft manuscript describing the fossil woods was finalized.

Nai-Zheng Du and Uttam Prakash

General:

A paper dealing with the Tertiary vegetation, palaeoclimate, phytogeography of south-east Asia was completed and manuscript finalized for publication.

Uttam Prakash and M. B. Bande

Tertiary from Abroad:

Studies on the fossil woods from Burma

The study of fossil woods identified as *Araucaria-Agathis*, *Koompassia*, *Lagerstroemia*, *Millettia*, *Afzelia-Intsia* and *Terminalia* was completed and a paper on 'a fossil wood of *Araucarioxylon*' was submitted from publication.

Nai-Zheng Du and Uttam Prakash

Studies on the fossil woods from the Tertiary of China

A draft manuscript dealing with eight fossil woods, viz., *Araucarioxylon shandongensa* sp. nov., *Pseudotaxoxylon chinense* sp. nov., *Elaeocarpoxylon jianganensis* sp. nov., *Robinioxylon subeiense* sp. nov., *R. zirkelli* (Platen) comb. nov. and *Fraxinoxylon*

mandshuricum sp. nov., was completed and a paper on the fossil wood of *Taxodioxylon* was submitted for publication.

Uttam Prakash and Nai-Zheng Du

Department of Quaternary Biogeography and Archaeobotany

Project : *Studies in the morphology of pollen grains, seeds and fruits*

Objective : *To prepare comparative data base and to identify the corresponding plant remains*

A manuscript entitled 'An atlas of pollen grains of Silent Valley' has been finalized. It comprises the pollen morphological observations of 130 modern plant species alongwith their illustrations and a pollen key.

H. A. Khan

Project : *Pollen zonation scheme for western Himalaya, western India and south Indian mountains*

Objective : *To work out the history of Quaternary flora and the factors determining it*

Thirty soil samples of a 4 m deep central profile from Naukutchiya Tal were pollen analysed. The quantitative and qualitative assessment of pollen taxa encountered in each sample were done, with the result 500-1000 pollen and spores were recorded in each sample. Qualitatively the samples are rich in saccate pollen and *Quercetum-mixtum* complex. The important taxa encountered are *Pinus roxburghii, P. wallichiana, Picea, Cedrus, Abies, Larix, Quercus incana, Q. dilatata, Betula, Ulmus, Corylus, Carpinus, Ilex, Acer, Rhus, Celtis, Glochidion, Juglans, Carya, Grewia, Rhododendron, Palaquium, Myrica, Alnus, Fraxinus, Salix, Valerina,* etc. amongst arboreal taxa; and Poaceae, Rosaceae, Oleaceae,

Apiaceae, Chenopodiaceae, Caryophyllaceae, Asteraceae, *Plantago*, etc. amongst non-arboreal taxa. The aquatics are predominated by *Potamogeton* and *Botryococcus*.

H. P. Gupta

The pollen analysis of seven surface samples enroute from Bareilly to Lalkuan, Uttar Pradesh was completed. Most of the samples have shown good yield. The vegetation shows a mixed trend of Tarai-Bhavar and submontane vegetation. The focal theme of this study is to have a precise information as regard to the interplay of pollen. This study would help to interpret the pollen diagrams in the right perspective constructed in the Bhavar region of Kumaon.

H. P. Gupta and R. R. Yadav

The diatom analysis of Kua Tal samples in Kumaon Himalaya has recorded a good yield of pennate diatoms. The prominent identified taxa are *Cymbella cymbiformis*, *C. ventricosa*, *Amphora* sp., *Gomphonema* sp., *Nitzschia apiculata*, *Nitzschia* sp., *Cocconeis* sp., *Caloneis siliqula*, *Fragillaria* sp., *Surirella* sp., *Anomoeoneis* sp., *Pinularia* sp. and *Cyclotella menaghiniana*.

H. P. Gupta and Asha Khandelwal

A manuscript entitled, 'The vegetational development during the 30,000 years B. P. at Colgrain, Ootacamund, Nilgiris, South India' was submitted for publication. On the basis of palynostratigraphy various events and episodes of vegetational and climatic developments have been recorded since 30,000 years B.P.

H. P. Gupta and Kamla Prasad

Six pollen spectra, three pollen diagrams and one vegetational map from district Sidhi, Madhya Pradesh have been finalized. The pollen spectra have revealed that the Sal forest is represented only by 12-13 per cent, of which 5-6 per cent and

0.5-1 per cent sal pollen are recorded from the margin of the forest and open land respectively. The pollen diagrams one each from Bastua, Chhui Stream and Amgaon in Sidhi District, Madhya Pradesh have revealed the following three distinct phases of vegetational development:

1. *Between 11,500 to 8,050 years B. P.*—Open grassland with an admixture of Brassicaceae, Scrophulariaceae, Cheno/Ams, Asteraceae, etc.

2. *Between 6,750 to 5,010 years B.P.*—The deciduous arboreal taxa such as *Anogeissus*, *Terminalia*, *Lagerstroemia* and Myrtaceae invaded into the grasslands and gradually tropical deciduous forest began to establish and continued till 1200 years B.P.

3. *Between 1200 years B. P. to Present*—The *Shorea robusta* alongwith *Acacia*, *Flacourtia*, *Zizyphus*, etc. invaded into the landscape constituting the modern Sal forest.

M. S. Chauhan

Project : *History of Silent Valley forests*

Objective : *To work out the antiquity of these forests through pollen analysis*

A manuscript entitled, 'History of Silent Valley-I' was finalized. In this paper various vegetational phases and the impact of climate in 1,000 years old profile have been discussed in detail.

H. A. Khan

Project : *History of ancient plant economy in India*

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

Detailed anatomical study of charcoal samples collected from a Chalcolithic site at Sringaverapura, Allahabad (C. 1050-700

B. C.) was carried out and they were identified as *Madhuca indica, Mangifera indica, Acacia* sp., *Ziziphus* sp., *Pinus* sp., *Salmalia malabarica, Albizia lebbeck, Mesua ferrea, Betula utilis* and *Bamboo.*

A paper entitled, 'The pre-Harappan plant economy at ancient Rohira (C. 2300-2000 B. C.), Sangrur District, Punjab' was finalized. It includes the remains of wheat, barley, lentil, sorghum, millet, fruit stone of date palm, etc.

K. S. Saraswat

A paper entitled, 'Plant economy at Ancient Narhan, Gorakhpur District, Uttar Pradesh (c. 700 B. C.—400 A. D.)' was submitted for publication. The study has revealed the occurrence of rice, wheat, barley, pea blackgram, green gram, khesari, kodon-millet, sesame, *Ziziphus* and Anwala. Besides, evidence of cotton was also recorded. *Saccharum spontaneum* and *Desmostachya* has also been recorded among wild grasses.

K. S. Saraswat and N. K. Sharma

The charcoal study from 11 archaeological sites, viz ., one Mesolithic in U. P., one Neolithic in Jammu and Kashmir, four pre-Harappan to Chalcolithic in Maharashtra, Andhra Pradesh and Madhya Pradesh and five from Iron Age to Late Historic period in Bihar, Gujarat, M. P. and Punjab has enabled to identify eleven more taxa such as *Picea smithiana, Buxus wallichiana, Aesculus indica, Prunus cornuta, Juglans regia, Trema orientalis, Cassia fistula, Lagerstroemia speciosa, Callicarpa arborea, Gmelina arborea* and *Hardwickia binata.*

The manuscript entitled, 'Ancient plant economy at Kayatha' was finalised. It includes the timber remains of *Acacia* and *Cassia fistula.*

Two taxa, viz., *Anogeissus* sp. and *Shorea* sp. recovered from

Ahichchatra, Bareilly District have been identified. Further work was continued.

Chanchala

Project : *Studies in the aerobiology*

Objective : *To study the aerobiota, more particularly aerospora, their production, dispersal and sedimentation for the applied and academic aspects*

The atmospheric pollen/spore catch for the period from March, 1984 to February, 1985 has been completed and on comparison with the earlier pollen-calendars certain variations were observed. *Betula*, a drifted pollen taxon, was observed for the first time. The occurrence of diatom taxa such as *Pinnularia*, *Cymbella* and *Synedra* during rainy season is the new finding. Further work was continued.

Asha Khandelwal

Six pollen spectra from Sidhi, Madhya Pradesh have been finalised. Observations of the pollen production and dispersal of *Shorea robusta* at different levels in the Sal forest have been completed. The above study has revealed that Sal tree, as reported earlier, is a very high pollen producer. Pollen production/population is 3,15,232,78,26,90,784 × 103/hectare. Sal pollen dispersed at ground level is 40-50 per cent, in trunk space 35 per cent, but 9-14 per cent above the canopy. A small percentage, however, is preserved in moss cushion within the forest (10-12%) and outside (2-4%). It has a poor dispersal efficiency as indicated by substantial decline in Sal pollen percentage away from the forest. Its poor preservation in soil samples within the forest as well as outside against its high pollen production requires investigation. Nevertheless, this may be due to pH value of the soil or the microbial activity.

S. K. Bera

Project : *Studies in ethnobotany among the Indian tribes of drought prone areas*

Objective : *To gather information on the mechanism of destruction of vegetation by man and on the early methods of primitive agriculture and to understand the significance of ethnobotanical and palaeopalynological data*

The ethnobiological studies at the Harappan site Surkotada, Kachchh District, Gujarat revealed that the recovered wild seeds were perhaps derived from the fodder stored by the ancient man.

Chanchala

Department of Pre-Gondwana and Gondwana Palynostratigraphy

Project : *Palynostratigraphy of Indian coal deposits*

Objective : *Stratigraphic delimitation and correlation of coal seams of Indian coal deposits*

Palynological investigations carried out from Lower Gondwana sediments in Godavari Valley were compiled. Delimitations of Talchir to Kamthi formations have been suggested on the basis of palynology. To study the bore-cores, the analysis of four bore-holes from Managuru area was undertaken.

S. C. Srivastava and Neerja Jha

The descriptive sporae dispersae recovered from the Lower Gondwana sediments of Talchir to Bijori formations from the western part of Satpura Basin were finalised. In all, 42 genera and 96 species were identified, out of which one genus and seven species were new. On the basis of palynostratigraphy four palynozones were distinguished relating to Talchir, Karharbari, Barakar and Bijori formations.

S. C. Srivastava and O. S. Sarate

Project : *Litho-palynopalaeobotany of Gondwana in Damodar, Son-Mahanadi, Satpura and Godavari basins and sub-Himalayan region*

Objective : *Stratigraphic and palynological delimitations and correlation of various lithological units*

The first phase of the work undertaken on the material from Birsinghpur-Pali Coalfield, South Rewa Gondwana Basin has been completed. This comprised 458 samples from 6 bore-holes and 3 out-crop sections. Besides the discovery of few new species, distinct assemblages in each section were delineated and nine palynozones were identified, ranging in age from early Permian to early Triassic. An assemblage of Pali Formation having Raniganj-type of affiliation, and another assemblage at Lower Parsora Formation showing Raniganj/Panchet transitionary phase have also been recognised.

R. S. Tiwari and Ram Awatar

The palynostratigraphic results of the various bore-cores from Raniganj Coalfield in Damodar Valley were compiled for the Permo-Triassic boundary and very significant reliefs were obtained indicating a demarcation almost at the Raniganj/Panchet boundary. The *Striatopodocarpites*, *Crescentipollenites*, *Densipollenites*-suite changes for *Striatopodocarpites*, *Klausipollenites*, *Lunatisporites*-suite at the boundary level. This continental sequence has given a complete picture for Permo-Triassic boundary for the first time.

R. S. Tiwari and Vijaya Singh

Detailed morphotaxonomic study of dispersed miospores recovered in samples of bore-hole no. 6 and 7 of RAD series, East Raniganj Coalfield was continued.

R. S. Tiwari and K. L. Meena

Maceration of samples from Bore-hole RAD-11 from East Raniganj Coalfield has shown that the yield is poor and only 3 samples within the Panchet Formation were found countable. The results are being compared with the known Panchet miofloras of India in the form of a note.

Vijaya Singh

Search for palynofossils in the Lesser Himalayas (central region) was continued. The findings are very scanty and poor. Studies on further collections were continued.

R. S. Tiwari

Twenty three samples recovered from Kalapani Limestone Formation, Tethyan Himalayan region, Malla Johar, Uttar Pradesh were macerated, out of which onethird samples yielded miospores. The richness and fine preservation of palynofossils in these sediments is very encouraging as they could provide control for finer dating within the Triassic. Detailed morphographic study of the spores and pollen was continued.

R. S. Tiwari and Vijaya Singh

The study of palynological analysis of the Bore-hole no. RJNE-9 near Barat, Rajmahal Basin has been completed. The findings indicate a late Raniganj age for the assemblage found in the sediments in this bore-hole. Palynological search in a sample from a section near Chaipani Village, Brahmini Coalfield has been completed. The palynological assemblage indicates the Raniganj age for the sediment, which is a first report to indicate the Raniganj affinity of beds in the region. Quantitative analysis of samples from bore-hole RJNE-16 from north-west part of Rajmahal Basin has been taken up.

R. S. Tiwari and Archana Tripathi

Project : *Palynostratigraphy of east coast Gondwana*

Objective : *To build up palynostratigraphy in the Gondwana basins of east coast of India*

A well-preserved and diversified assemblage has been recovered from Athgarh Formation, Sidheshwar Hill, Orissa and the genera, viz., *Dictyophyllidites*, *Concavissimisporites*, *Verrucosisporites*, *Coniatisporites*, *Matonisporites*, *Sestrosporites*, *Densoisporites*, *Reticulatisporites*, *Foveotriletes* have been recorded for the first time from this region. A late Jurassic age has been suggested for this assemblage.

R. S. Tiwari and B. N. Jana

Project : *Morphotaxonomic study of fossil spores and pollen grains*

Objective : *To study the morphographic characters of spore-pollen taxa and to circumscribe them for taxonomic purposes*

A new trilete-bearing reticulate miospore genus has been described from the Triassic sediments of Rajmahal Hills.

R. S. Tiwari and Archana Tripathi

Morphotaxonomic circumscription of the sporae dispersae of Rajmahal Basin is being done.

R. S. Tiwari, Parmod Kumar and Archana Tripathi

Morphographic study of dispersed tetrads of various types in the Lower Panchet Formation in the Raniganj Coalfield has been completed.

R. S. Tiwari and K. L. Meena

Morphotaxonomic circumscription of the sporae dispersae of Satpura Gondwana Basin was continued.

S. C. Srivastava and O. S. Sarate

Detailed study of a new monolete miospore genus *Navalaesporites* was carried out through incident light as well as by SEM technique.

O. S. Sarate and Ram Awatar

Occurrence of megaspore in Kamthi Formation in Ramagundam area and Chilpur was reported.

S. C. Srivastava and Neerja Jha

Card-indexing programme, coding of palynological references and other related scientific data are being feeded in the computer.

R. S. Tiwari, S. C. Srivastava, Archana Tripathi, B. N. Jana, Vijaya Singh, Neerja Jha, Ram Awatar, K. L. Meena, Asha Guleria, D. C. Joshi and Govindraja Rajagopalan

Department of Post-Gondwana Palynostratigraphy of Peninsular India

Project : *Palynostratigraphy of the Tertiary sediments of north-east India*

Objective : *To carry out morphotaxonomical investigation of palynomorph assemblages and to determine their botanical and stratigraphical significance*

The maceration of 40 samples from Prang Limestone was done, out of which 30 samples proved productive. This assemblage comprises fungal elements, pteridophytic spores and angiospermic pollen grains. The pteridophytic spores are dominant and mostly represented by *Cyathidites*, *Lygodiumsporites*, *Todisporites*, *Striatriletes*, *Polypodiaceaesporites* and *Polypodiisporites*. Amongst the angiosperms *Tricolpites*, *Pellicieroipollis*, *Meliapollis*, *Paleosantalaceaepites* and

Polycopites are occasionally met with. The presence of *Striatriletes* in this limestone is significant as this is the first record in the Middle Eocene of north-east India.

Chemical processing of 36 samples from Jarain Colliery, Meghalaya was done, out of which 24 samples yielded microfossils. The pteridophytic spores are very rich in the assemblage and *Dandotiaspora, Cyathidites, Todisporites, Polypodiaceaesporites* and *Polypodiisporites* are frequently found. The angiospermic pollen genera which are also commonly found are : *Polycolpites, Meliapollis, Lakiapollis, Retitribrevicolporites, Palmaepollenites, Couperipollis, Matanomadhiasulcites, Pseudonyssapollenites, Pellicieroipollis* and *Tripilaorites.* On the basis of palynofossils, a Palaeocene age has been ascribed for the assemblage.

R. K. Kar

Palynological study of Sutunga Coal seams, Jaintia Hills, Meghalaya was completed. The assemblage consists of 39 species comprising 27 genera of pteridophytes and angiosperms. Quantitatively the spores and pollen grains are, more or less, equally represented in the assemblage. The assemblage is characterised by the dominance of *Lycopodiumsporites, Parvireticulatus, Cyathidites minor, Lygodiumsporites lakiensis, Todisporites kutchensis, Proxapertites microreticulatus, Couperipollis brevispinosus* and *Tricolpites minutus.* On the basis of recovered palynomorphs the Sutunga assemblage has been assigned to Palaeocene.

J. P. Mandal

The palynological assemblage recovered from five sections in Khasi Hill belonging to Lakadong Sandstone consists of 51 genera and 109 species, out of which 2 genera and 2 species of fungal spores, 16 genera and 28 species of pteridophytic spores, 2 genera and 3 species of gymnospermous pollen and 31 genera and 66 species are of angiospermic pollen grains. The assemblage is characterised by the dominance of pteridophytic spores, viz.,

Lycopodium speciosus, *Dandotiaspora dilata*, etc. The qualitative and quantitative abundance of different species were plotted separately for each section.

Madhav Kumar

Slides of productive samples collected from the Kopili Formation were scanned and important palynomorphs were photographed. Description of the pollen and spores is being written.

G. K. Trivedi

Three hundred fifty samples collected from five coal seams in the Ledo Colliery were macerated and the important palynomorphs were photographed. The assemblage is dominated by pteridophytic spores and angiospermic pollen grains. The gymnospermous pollen are rare. The dominant forms are *Lycopodiumsporites*, *Lygodiumsporites*, *Cyathidites*, *Todisporites*, *Striatriletes*, *Polypodiaceaesporites*, *Dictyophyllidites*, *Reticulatisporites*, *Polypodiisporites*, *Schizosporis*, *Liliacidites*, *Palmaepollenites*, *Tricolpites*, *Retitrescolpites*, *Polycolpites*, *Palaeosantalaceaepites*, *Couperipollis*, *Triporopollenites*, *Bombacacidites*, *Polyadopollenites*, etc.

B. D. Mandaokar

Project : *Palynostratigraphy of the Upper Cretaceous sediments of Meghalaya*

Objective : *To carry out the morphotaxonomy of the Upper Cretaceous palynomorphs and to establish palynological zones*

Study of the palynofossils recovered from the Jadukata and the Mahadek formations exposed in Meghalaya was completed. The assemblage consists of 67 genera and 114 species and is dominated by pteridophytic spores and gymnospermic pollen grains ; the angiospermic pollen grains are poorly represented. The Jadukata palynological assemblage is dominated by *Araucariacites*, *Densoisporites*, *Gleicheniidites*, *Cyathidites*, *Todisporites*, *Appendicis-*

porites, Cicatricosisporites, Klukisporites, Coptospora, Triporoletes and *Stephanoporopollenites.* The assemblage recovered from the Mahadek Formation is dominated by *Ariadnaesporites, Araucariacites, Coptospora, Cyathidites, Contignisporites, Dictyophyllidites, Intrapunctisporis, Lygodioisporites, Triporoletes, Minerisporites, Schizosporis, Cycadopites, Palmaepollenites, Tricolpites, Stephanoporopollenites,* etc. On the basis of palynoflora, the age of Jadukata Formation is assigned as Upper Albian-Cenomanian and the Mahadek Formation as Turonian (if not older). A paper incorporating the results of this study has been submitted for publication.

R. S. Singh

Project : *Palynological investigation of Rajpardi Lignite*

Objective : *To carry out the palynological investigation of Rajpardi lignite and to ascertain its age*

Palynostratigraphical investigation of Rajpardi lignite, Broach District, Gujarat was completed. The total palynomorphs recovered consists of 38 dispersed spore-pollen genera and 42 species. The assemblage has been divided into three palynological cenozones which in the ascending order are : *Polygalacidites rhomboidus* Cenozone, *Inapertisporites kedvesii* Cenozone and *Arengapollenites achinatus* Cenozone. The characteristic species of *Polygalacidites rhomboidus* Cenozone are : *Thymelaepollis crotonoides, Dracaenoipollis circularis, Inapertisporites kedvesii, Lygodiumsporites lakiensis, Arengapollenites achinatus, Lakiapollis ovatus, Tricolpites reticulatus* and *Palmaepollenites ovatus.* The significant species of *Inapertisporites kedvesii* Cenozone are : *Couperipollis achinatus, Lygodiumsporites lakiensis, Palmaepollenites magnus* and *Pluricellaesporites planus,* while *Arengapollenites achinatus* Cenozone consists of *Inapertisporites kedvesii, Lygodiumsporites lakiensis, Dandotiaspora plicata, Couperipollis achinatus, Couperipollis ankleshwarensis, Laevigatopolycolpites rotatus, Palmaepollenites ovatus* and *Phragmothyrites eocaenica.*

The dominance of palm pollen like *Arengapollenites achinatus, A. ovatus, Palmaepollenites kutchensis, P. ovatus, P. magnus, Dracaenoipollis*

circularis, Couperipollis achinatus, C. pollis, C. ankleshwarensis, C. rarispinosus and *Spinozonocolpites echinatus* in the Rajpardi assemblage points towards a Palaeocene-Lower Eocene age.

It has been postulated that the lower part of the lignite was deposited above the storm tide zone due to the abundance of palm pollen. The absence of microplanktons in most of the samples also corroborates this assumption. The dwindling down of palm pollen in upper part probably indicates that the basin was gradually lowering down and the deposition took place in between equinoctial to storm tide zone where the ferns flourished.

On the basis of above mentioned taxa a Palaeocene age has been assigned to this assemblage. Due to the presence of *Couperipollis, Proxapertites, Polypodiisporites, Lakiapollis, Retitribrevicolporites, Tricolpites, Polygalacidites, Palmaepollenites* and *Pseudonyssapollenites* in rest of the samples a Lower Eocene age for the samples has been postulated.

R. K. Kar

Project : *Palynostratigraphical investigation of the grab and core samples from the Indian Ocean*

Objective: : *Interpretation of the distribution of palynomorph complex, biozonation, correlation of the different strata and deciphering the environment of deposition*

Detailed palynostratigraphical study on the deep core samples (Site 218, Leg. 22) from the Bengal Fan was continued. Some of the important genera are *Cyathidites, Todisporites, Osmundacidites, Laevigatosporites, Polypodiisporites, Podocarpidites, Polypodiaceaesporites, Leptolepidites, Lycopodiumsporites, Palmaepollenites, Polyadopollenites, Liliacidites, Assamiapollenites, Grammidites, Pinjoriapollis, Echinomonoletes, Retimonoletes, Tricolpites, Pinuspollenites, Abiespollenites, Inapertisporites, Monoporisporites, Aplanosporites, Staphlosporonites, Didymoporisporonites, Utricularia, Hystrichosphaeridium, Foveofusa, Leiosphaeridia,* etc.

Systematic description of the palynofossils alongwith stratigraphical interpretation was continued.

Anil Chandra

The pollen/spores recovered in the surface sediments from the continental shelf and slope off Karnataka match in general with those of the corresponding coastal vegetation. Herbaceous pollen and pteridophytic spores are dominant over the trees and mangrove vegetation. Pollen/spores have been recorded up to 123 km off the coast. The coarse grained sediments are generally devoid of pollen and spores. The pollen analysis of samples collected from near the coast shows comparatively higher concentration of pollen and spores.

Ram Ratan and Anil Chandra

Department of Post-Gondwana Palynostratigraphy of Extra-Peninsular India

Project : *Palynostratigraphy of the Tertiary sediments of Lower Assam*

Objective: : *To study palynoflora of the Tertiary sediments of the region and its application in stratigraphy*

A paper entitled 'Palynology of the Jaintia Group (Palaeocene-Eocene), Meghalaya, India (Part-I)—Systematic palynology' dealing with the systematic description of pteridophytic spores and angiospermic pollen grains was submitted for publication. It includes 15 pteridophytic and 20 angiospermic genera recovered from the Jaintia Group sediments exposed along the road between Jowai and Sonapur, Meghalaya.

S. K. M. Tripathi and H. P. Singh

A paper entitled, 'Palynology of the Jaintia Group (Palaeocene-Eocene), Meghalaya, India (Part II)—Qualitative and quantitative analyses and date interpretations' was submitted for publication. This paper deals with the comparative studies of the Lower Tertiary palynological assemblages with reference to the palynoassemblage recovered from Jaintia Group sediments of Meghalaya. Besides, the palaeoecology and palaeoenvironment of the investigated area have also been discussed in it.

H. P. Singh and S. K. M. Tripathi

A manuscript dealing with a critical review on the palynological works in Assam and Meghalaya Basin is being prepared.

S. K. M. Tripathi

Eighteen genera and 24 species of angiospermous pollen grains recovered from the Barail (Oligocene) and Surma (Lower Miocene) sediments exposed along Sonapur-Badarpur Road Section in Jaintia Hills (Meghalaya) and Cachar (Assam) have been studied and described. Of these, four species, viz., *Couperipollis donaensis*, *O. ramanujamii*, *Echistephanocolpites meghalayaensis* and *Polyadopollenites sahnii* are new. The stratigraphic distribution of the angiospermous pollen taxa in the various formations of the section has been studied. The assemblage has been compared with the known contemporaneous assemblages from north-eastern India and also from other area to find out similarities and differences amongst them. A paper incorporating the results has been submitted for publication.

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

Qualitative and quantitative analyses of the Barail-Surma palynoflora recovered from the Sonapur-Badarpur Road Section in Jaintia Hills (Meghalaya) and Cachar (Assam) have been done, which reveal that the assemblage is composed of dinoflagellate cysts (5%), fungal remains (4.5%), pteridophytic spores (62%) being represented by Lycopodiaceae, Polypodiaceae, Matoniaceae,

Hymenophyllaceae, Ophioglossaceae, Schizaeaceae, Cyathiaceae, Osmundaceae, Gleicheniaceae and Parkeriaceae; gymnospermous pollen grains (23%) being represented by Podocarpaceae and Pinaceae; and angiospermous pollen grains (5.5%) being represented by Palmae, Potamogetonaceae, Nymphaeaceae, Oleaceae, Bombacaceae, Labiatae, Mimosaceae and Malvaceae. Based on the palynofloral analysis, palaeoclimate and environment of deposition prevalent during the sedimentation of the Barail-Surma stratal sequence have been interpreted and discussed. The assemblage has been compared with the known contemporaneous assemblages from various parts of India and its age has been discussed. A manuscript incorporating the above study is being prepared.

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

A manuscript on 'Palynology of the Barail (Oligocene) and Surma (Lower Miocene) sediments exposed along Sonapur-Badarpur Road Section, Jaintia Hills (Meghalaya) and Cachar (Assam)—Part-IV. Gymnospermous pollen grains' was completed. The assemblage consists of five genera and seven species, of which three species, viz., *Podocarpidites meghalayaensis, Pinuspollenites foveolatus* and *Abiespollenites surmaensis* have been proposed to be new. The general characters of the extant pollen grains of *Pinus, Abies, Picea* and *Podocarpus* have been studied and compared with those of comparable fossil pollen grains. In the light of this study, the diagnoses of *Podocarpidites, Pinuspollenites, Piceapollenites* and *Abiespollenites* have been restated. A paper incorporating the results has been submitted for publication.

M. R. Rao

Pteridophytic spores recovered from the Barail (Oligocene) Surma (Lower Miocene) sediments of Sonapur-Badarpur Road Section, in Jaintia Hills (Meghalaya) and Cachar (Assam) were studied. The assemblage comprises 18 genera and 32 species. *Biretisporites oligocenicus, B. meghalayaensis, Striatriletes pachyexinus, S. sinuosus, Dictyophyllidites indicus* and *Lygodiumsporites donaensis*

have been established as the new species. The diagnosis of *Lygodiumsporites* has been amended. Quantitative analysis of the assemblage reveals that the pteridophytic spores are dominant (63%) in the assemblage. Palynological data reveal that the tropical-subtropical humid climate prevailed during the deposition. A manuscript incorporating the description and discussion of the above assemblage was submitted for publication.

M. R. Rao and H. P. Singh

Project : *Palynostratigraphy of the Lower Tertiary sediments of Simla Hills, North India*

Objective : *To carry out the morphotaxonomical investigations of palynomorphs assemblages and to determine their botanical and stratigraphical significance*

A paper entitled, '*Inaperturotetradites udarii*—A new name for *Inaperturotetradites psilatus* Rao & Ramanujam, 1982' was sent for publication. A manuscript on '*Udaria* gen. nov. with two new species from the Lower Tertiary sediments of Himachal Pradesh, India' is being prepared.

Asha Gupta

A morphotaxonomic study of palynomorph assemblage recovered from Dadahu-Jhamuta area, in Sirmur District of Himachal Pradesh was continued. The present assemblage is dominated by fungal elements. Recovery of pollen and spores, etc. is poor. A large number of specimens, appearing to be new, are being investigated morphologically.

H. P. Singh and Asha Gupta

Two paper entitled, 'Palynostratigraphy of the Subathu Formation, Banethi-Bagthan area, Himachal Pradesh, India' and another paper entitled 'Significant palynozones of the Subathu Formation (H. P.) and their bearing on stratigraphy' were submitted for publication.

H. P. Singh and Samir Sarkar

A paper entitled, 'The palynology of Subathu Formation (Eocene) Banethi-Bagthan area, Himachal Pradesh, India' has been finalized. It deals with the detailed morphotaxonomical studies of palynofossils recovered from the Subathu sediments of Banethi-Bagthan area.

Samir Sarkar and H. P. Singh

Detailed stratigraphical investigations in the Koshalia River Section near Koti and adjoining area were carried out. A manuscript entitled, 'A microplankton assemblage from the Koshalia River Section near Koti, Himachal Pradesh, India' was prepared.

H. P. Singh and Samir Sarkar

Chemical processing of rock samples from the Garhkhal area of Himachal Pradesh was done and detailed morphotaxonomical studies of the recovered palynomorphs has been undertaken.

Samir Sarkar

Study and identification of the palynofloral assemblage from the Dharmsala Group exposed along Charan Khad and Manji Khad sections in Kangra District, Himachal Pradesh were continued. The description of the recovered palynomorphs is being written.

R. K. Saxena and A. P. Bhattacharyya

Project : *Palynostratigraphy of the Siwalik sediments of Bhakra-Nangal and adjoining areas*

Objective : *To study palynoflora of the Tertiary sediments of the area and its importance in stratigraphy*

A manuscript incorporating the palynofloral study of the Lower Siwalik (Nahan) and Upper Siwalik sediments exposed along Kala Amb-Nahan Section in Sirmur District, Himachal Pradesh has been submitted for publication.

R. K. Saxena and A. P. Bhattacharyya

Palynological study on the Middle Siwalik sediments of Manasa Devi Road Section and Chandi Devi Road Section, Haridwar was continued. The pollen/spores recovery from the Mansa Devi Road Section was better and it contains diversified pteridophytic and angiospermic spores and pollen grains.

S. K. M. Tripathi

Scanning and microphotography of the spore-pollen recovered from the rock samples of Masol-Kiratpur Road Section (Upper Siwalik, Tatrot & Pinjor) have been completed and the identification of the palynomorphs is being done.

M. R. Rao

A paper entitled, 'A Siwalik palynoflora from Nalagarh area,' Solon District, Himachal Pradesh, India' has been finalized. The palynofloral assemblage consists of 24 genera and 30 species of gymnospermous and angiospermous pollen, pteridophytic spores, and fungal spores and conidia.

Samir Sarkar

Material from Abroad:

Detailed morphotaxonomical studies of palynomorphs recovered from the Tertiary sediments of north-east Congo were carried out. The palynological assemblage is dominated by pteridophytic spores and angiospermous pollen grains. Some of the important identical genera are *Striatriletes*, *Polypodiisporites*, *Polypodiaceaesporites*, *Crassoretitriletes*, etc. The overall assemblage indicates Miocene in age.

Samir Sarkar and H. P. Singh

Department of Planktonology

Project : *Marine microplankton biostratigraphy of Mesozoic and Cenozoic sediments of India*

Objective : *To study the morphotaxonomy of phytoplankton of marine Mesozoic and Cenozoic sediments of India and their application in stratigraphy, palaeogeography and palaeoenvironment*

Cauvery Basin :

The rock samples from the Dalmiapuram, Uttatur, Trichinopoly and Ariyalur formations were chemically processed.

Microphotography of the dinocyst taxa recovered from the samples of bore-hole EBD-12 was completed. Some of the important identified genera are : *Deflandrea, Callaiosphaeridium, Meiourogonyaulax, Coronifera, Aptea, Spiniferites, Gonyaulacysta, Areoligera* and *Oligosphaeridium.*

Precise identification of various dinocyst species from the Trichinopoly Formation was done. Amongst them, some of the important species are : *Hystrichodinium pulchrum, Coronifera oceanica, Cleistosphaeridium granulatum, Aptea polymorpha, Odontochitina operculata, Exochosphaeridium phragmites, Canningia colliyeri, Tanyosphaeridium variecalamum* and *Cyclonephelum paucispinum.*

K. P. Jain and Khowaja Atteequazzaman

Morphotaxonomy of dinocysts recovered from samples of Karaikal well-9 was continued. The taxa which have been identified are : *Fibrocysta bipolare, Apectodinium paniculatum, Wetzeliella* cf. *astra, Tityrosphaeridium gracilis,* ? *Tityrosphaeridium funiculatum, Deflandrea phosphoritica, Palaeocystodinium* sp., *Hystrichokolpoma unispinum, Lejeunecysta hyalina, Deflandrea* sp., *Achomosphaera alcicornu, Operculodinium centrocarpum, Amphorosphaeridium* sp., *Diphyes colligerum, Spiniferites* spp., *Cleistosphaeridium, Adnatosphaeridium* spp. and *Homotryblium plectilum.*

Rahul Garg and K. P. Jain

Palar Basin

Forty rock samples of a 765 m thick exploratory bore-hole drilled at Chingleput District were chemically processed and slides of productive samples were prepared.

Detailed morphotaxonomy of various dinocyst species, viz., *Oligosphaeridium diluculum*, *O. pulcherrimum*, *O. complex*, *O. totum* var. *totum*, *O. totum* var. *minor*, *O. irregulare*, *O. albertense*, *Odontochitina operculata*, *Coronifera oceanica*, *C. albertii* recovered from the samples of bore--hole PUD was done. Three new species, viz., *Odontochitina cornucavata*, *Odontochitina brevispinosa* and *Coronifera quadrispinosa* are established. A modified description for the genus *Odontochitina* has been proposed.

A paper entitled 'Dinocyst genus *Discorsia* Duxbury : A reinterpretation' was submitted for publication.

K. P. Jain and Khowaja-Ateequazzaman

Project : *Nannoplankton biostratigraphy of marine sediments of Narmada Valley, Kachchh and Rajasthan, western India*

Objective : *To study various lithounits of sedimentary basins in western India for fine biozonation and deducing palaeoenvironment*

Kachchh Basin

A manuscript 'Late Middle Eocene calcareous nannoplankton from Kachchh, western India' has been completed. Besides, monographic treatment of nannoplankton, problems of palaeoecology, precise biochronological data concerning Middle/Upper Eocene boundary on a global scale were discussed.

S. A. Jafar and Jyotsana Rai

Calcareous nannoplankton from well-measured and productive sections of Vagadhkol and Bodhan formations exposed around

Tarakeshwar town in Surat area, have been documented. The rich nannoflora of Kusimbha Tal and Ghalha Nala sections reveal minor differences in assemblage, but well exposed foraminiferal limestones and marls contain latest Eocene elements referable to N P-20 *Sphenolithus pseudoradian* Zone. This is the first time that the Upper Eocene beds of Surat area have been precisely dated, while the beds older or younger than *S. pseudoradian* Zone are missing. The well known *Pellatispira* bearing limestones belong to upper part of this zone containing other marker larger forams as well.

S. A. Jafar and Jyotsana Rai

The first draft of the manuscript 'Late Bathonian calcareous nannoplankton from basal part of Jhumara Formation, Kachchh, western India' has been completed. The assemblage contains 31 species including one new genus, one new species and several new combinations.

S. A. Jafar and R. K. Saxena

Department of Biodiagenesis

Project : *Biopetrology of Indian coal deposits*

Objective : *Evaluation of coal for classification and utilization*

Rank determination by reflectance measurements on the remaining 19 particulate coal pellets from bore-hole no. CMSA—111 of Amlori area, Singrauli Coalfield was completed alongwith selective photomicrography of the coal microconstituents. Histograms alongwith lithologs of the three bore-holes (NCSM-3, CMSA-111 and NCSJ-4) and several other plottings utilizing biopetrological, rank and chemical (proximate) data of these coals have been completed to ascertain the nature and typology of the coals. Compilation of the results in the form of a thesis has partly been completed.

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

A paper entitled 'Coal typology, genesis and rank of West Bokaro coal, Bihar, India' has been finalized. The study shows that in highly disturbed West Bokaro Basin, owing to the fluctuating hydrological conditions, climatic and tectonic set up, four varied genetic coal types, viz., Vitric, Fusic and Intermediate (inertinite, dominant and vitrinite dominant intermediates) were formed irrespective of space and time. Role of tectonic set up and intrusive bodies have been attributed to the sudden enhancement of rank in the area.

G. K. B. Navale and Rakesh Saxena

All the 43 coal samples from East Bokaro have been processed and pellets were prepared. Study of six pellets has shown some interesting coal entities and mineral associations were continued.

More coal samples from the Barakar horizons are being scanned to understand the nature of minerals in Bokaro coals. The study has indicated the common presence of siderite, pyrite and clay minerals.

Thirty coal samples from Ramgarh have been processed for biopetrological studies. Examination of some of the pellets reveal very characteristic vitrinites which are highly reflecting.

Rakesh Saxena

A revised paper dealing with the significance of vitrinite/inertinite ratio of Lower Gondwana coals from Peninsular India was submitted for publication.

G. K. B. Navale and B. K. Misra

The nature and genesis of fossiliferous inorganic concretions present in the coal and carbonaceous beds of Garu Formation, Arunachal Pradesh have been studied in detail. These concretions are described here as 'coal balls'. The presence of coal balls also indicates that the sediments comprising Garu Formation were

deposited in shallow marginal swamps. A manuscript entitled 'Occurrence of coal balls in Gondwana sediments of Arunachal Himalayas, India' has been prepared.

The maceral and microlithotype analyses of 16 Gondwana coal samples from Siang, Subansiri and Kameng districts of Arunachal Pradesh have been completed. The reflectance studies were continued.

Anand Prakash

The coals of Permian Period in India are characterised by variable composite coal types each of which shows community of characters with significant differences. Such differences have been attributed to postulate changing palaeolatitudinal positions and interaction of climate, flora and tectonic sedimentary factors. A manuscript on the study was prepared.

The Lower Gondwana coal composition is unique in its characters and structural features which provide indication to palaeoclimatic conditions. In a paper entitled 'Palaeoclimatic vicissitudes during the Lower Gondwana coal formation in India' critical evaluation of anthracological characters have been assessed in relation to palaeoenvironments.

A paper entitled 'Definition of terms and a classification system of coal resources' was submitted for publication. A uniform, precise standard terms and a classification system to coordinate coal resource estimate have been presented in it.

G. K. B. Navale

A paper dealing in detail with the biopetrological and rank characteristics of the coals from Nazira Coalfield, Nagaland is being written. Information concerning biopetrological and rank characteristics (Barail Group-Oligocene) is being compiled.

B. K. Misra

Biopetrological and maturation studies of nine coal samples representing various sections of Siwalik sediments in Arunachal Pradesh have been carried out. The study indicates that the coals which are closer to the tectonic features are higher in rank than the coals which are away from such disturbances.

Anand Prakash

Three shale samples from Gujarat have been processed through various techniques for dispersed organic matter study. The samples contain very little organic matter. However, a few vitrinitic and inertinitic particles were observed. The study was continued.

G. K. B. Navale, Anand Prakash and Rakesh Saxena

Three coal samples (Eocene) from the main seam of the Bapung Coalfield and six carbonaceous shale samples (Cretaceous) from Palar Basin, South India were thoroughly scanned under incident light with Ultra-Violet and Blue light irradiation with a view to assess liptinitic (exinite) and other hydrogen-rich micro-constituents. Selective photomicrography on black and white film was also done. The study revealed common occurrence of resinite, bituminite, flurinite and other unidentifiable waxy/resinous material in the Bapung coals.

The samples of Palar Basin were found to be rich in cutinite belonging to two generations, thereby suggesting recycling (reworking) of the organic matter and the sediments to some extent. Maceral bituminite is also common alongwith random occurrence of microsporinite in pockets, whereas the resinite is poorly represented.

B. K. Misra

Project : *Palynostratigraphy of Indian coal deposits*

Objective : *Stratigraphic delimitation and correlation of coal seams of Indian coal deposits*

A paper entitled 'Palynology of Raniganj sediments from bore holes, G.R.T-OV/79, D.M.M-OV/79 and S.S-OV/79, Rani-

ganj Coalfield, West Bengal, India' has been finalized.

A paper entitled 'Palynology of the Talchir Formation from Betul Coalfield, Satpura Basin, India' has been completed and submitted for publication. The study indicates the dominance of radial monosaccate miospores in the palynoflora suggesting the presence of basal Talchir sediments in Betul Coalfield.

S. C. Srivastava, Anand Prakash and O. S. Sarate

The draft of a paper entitled 'A Karharbari mioflora from Tawa Valley, Satpura Basin, M. P., India' has been prepared and on the basis of this study the presence of Karharbari microfossils from this part of Satpura Basin has been reported for the first time.

Anand Prakash and S. C. Srivastava

The sporae dispersae of the Lower Gondwana sediments from Pathakhera Coalfield and other areas have been assigned to 42 genera and 96 species. A new monolete miospore *Navalesporites* has been described. Seven new species and a new combination are proposed. Talchir mioflora recovered from Mura-Kuppa area is similar to the mioflora known from the older Talchir sediments of the Indian Lower Gondwanas. The Bagdona (lowermost) coal seam of Pathakhera Coalfield is miofloristically Upper Karharbari in age, whereas the Upper (Top) and the Middle workable coal seams have been assigned to Lower Barakar age. Motur sediments are studied in bore-hole No. CMPS-43 of Shobhapur Block, Pathakhera Coalfield. Here the Lower Barakar mioflora continue to exist into lithologically differentiated Motur sedimentt. The palynological studies carried out in Pathakhera and other areas have provided a standard parameter for further investigations in the younger horizons of other areas in Satpura Basin.

S. C. Srivastava and O. S. Sarate

A paper entitled 'Geological and biostratigraphical studies of Permian sediments in West Bokaro Coalfield, Bihar, India' has been finalized. The "O" seam of the area earlier dated to Karharbari has been found to be of Barakar age. Besides, a possible tectonic set up of the area has been indicated.

Morphotaxonomic studies of various spores and pollen have been carried out and a paper is being finalized.

A paper entitled 'Some new miospores from the Barakar Formation (Lower Permian) of Lower Gondwana Sequence, India' is being prepared.

Scanning Electron Microscopical study on *Gondisporites* has been finalized and a paper entitled. *'Gondisporites imbricatus* Segroves and its palaeogeographical significance in Gondwanaland' has been sent for publication. The study shows the first record of *Gondisporites imbricatus* from the Lower Permian of India, which was earlier known from Upper Permian of Australia suggesting a time gap in the development of this taxon in two distantly apart continents. A possible migratory route has been traced out for its migration from India to Australia.

Rakesh Saxena

Project : *Palynostratigraphic study of organic remains of coastal and Upcountry lignites*

Objective : *Stratigraphic delimitation, correlation and petrographic evaluation of lignite deposits of India*

Miospores recovered from 3 bore-core samples (B. H. NLE-27, NLE-35 and NLE-36) from Neyveli lignite, Tamil Nadu have been assigned to 27 genera, of which few miospore genera are new. Speciation of 22 genera into 59 species has been accomplished. Out of 59 species, some are new. Various genera and species have been studied in detail for their morphographic circumscription. The work is being compiled.

Based on large number of pollen grains of the genera *Meliapollis* and *Dorreenipites* (*Trilatiporites*) two papers entitled '*Meliapollis* Complex—A re-evaluation of the pollen grains of *Meliapollis*' and 'Trilatiporate pollen grains—their revised status and palynostratigraphic significance' are being finalized. Both the genera have been revised with the institution of two additional genera in the former and one in the latter. The speciation by codification encompassing most of the genetic characters has been proposed. Possible evolutionary trends and migratory routes have also been suggested. Their stratigraphic significance has been established.

Quantitative assessment of various genera in 3 lateral sections (500/2125, 775/2275 and 1125/2375) and 3 bore-cores (B. H. NLE-27, NLE-35 and NLE-36) has been completed. Photomicrography of selected microspores has been done.

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

Department of Radiometric Dating

Project : *Radiocarbon dating*

Objective : *Age determination of Quaternary sediments in relation to biostratigraphic units and dating of geological and archaeological samples*

In all, 94 samples including anthracite background and oxalic acid C-14 standard were processed. Of the 81 dated samples, 35 samples pertain to geological and Quaternary palynological investigations and the rest to archaeological materials belonging to various cultures.

Miliolites—So far about 25 samples of miliolites from Saurashtra have been dated from various localities and the results are being interpreted.

Nepal Series—Five wood samples collected along the river section in Thimi, Nepal have been dated. The age of the samples ranges from 34,000 yrs to 40,000 yrs.

Kankar—To find out the rate of subsidence in the Gangetic Plain some samples of Kankar (concretions of carbonate deposit) from Gangetic alluvium were dated for an exploratory investigation.

The age calculation and presentation of C-14 age results have been programmed in the computer recently installed in the laboratory. A computer program for compilation of C-14 age results has been devised and so far about 1400 C-14 dates have been entered into the Computer file which classifies and sorts the age data according to archaeological, geological, oceanographic and Quaternary palynological investigations.

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

Project : *Fission track dating*

Objective : *To establish fission track dating technique and to date different rocks and minerals with special reference to fossiliferous strata*

Annealing characteristics of Glauconite :

The dependence of the optimum etch time with the percentage of annealing has been studied. A plot of etching time against the corresponding induced track density for glauconite grains annealed at different temperatures (90°, 120°, 150° & 180°C) for different annealing times (few minutes at higher temperatures to few days at lower temperatures) showed that the optimum etch time varies from 35 min. to 38 min., i.e. 91 per cent increase. This study will greatly help to determine whether the glauconite samples were annealed during the geologic period.

Fortyone glauconitic sandstone samples collected from Lodhwara South (19), Lodhwara North (7) and Sangrampur (15) hillocks at Chitrakut, Banda District (Uttar Pradesh & Madhya

Pradesh) were processed and glauconite grains from these samples were separated with the help of Frantz isodynamic magnetic separator. To obtain good separation of glauconite grains from different samples the settings of forward and side slope values were varied from 15°-25° and 5°-25° respectively at the constant value of the current (1.5 amp.) for magnetic field coils.

The dating of 22 glauconite samples from three different localities at Chitrakut area, Banda District have been completed. The F-T ages of these samples vary from 1030 Ma to 1380 Ma. At Sangrampur hillock the glauconite grains infilling the cracks of the base rock gave the highest F-T age of 1380 Ma, while the glauconitic sandstone at about 16 m height from the base rock gives the youngest age of 1030 Ma. The most important feature of the Lower Vindhyan deposition at Chitrakut, Banda District is the formation of pellet limestone. This event is contemporaneous to all the three localities. Present study shows that this event started around 1200 Ma and ended around 1120 Ma ago.

GL-O(g), a sample widely used as international standard for K-Ar dating was dated and the result was found to be in good agreement with the existing K-Ar and Rb-Sr age data. The F-T ages of glauconite samples from the different formations of peninsular India was redetermined using the GL-O(g) age standard. The F-T ages of all samples have shown excellent agreement with their earlier F-T dates.

The F-T dating of three blind check samples of glauconite (ODEH, EHOC & DHIB) from the sedimentary basins of France has been completed and the results have been sent to Department of Geologie Dynamique, Universite Pierre et Marie Curie, Paris for comparison with their K-Ar ages.

Two manuscripts one entitled, 'Fission-Track dating of glauconite in a condensed Lower Vindhyan Sequence (Middle Proterozoic) in north-central India' and the other 'Fission-Track ages of Lower Vindhyan glauconite beds at Mirzapur, U. P.' have

been submitted for publication. The results on Lower Vindhyan deposits at Chitrakut area, Banda District and of Machharmara Section, Mirzapur District have been communicated for publication.

F-T age determinations of petrified woods :

Dating of two petrified wood samples from Rajasthan area were carried out on in-situ apatite grains. The F-T ages of samples BSFT 126 and BSFT 127 collected from Habur, Jaisalmer District, Rajasthan have been calculated to 46.2 ± 6 Ma respectively. These results are in good agreement with the geological age (Tertiary) of the Kuiala Formation from where these samples were collected.

Research in Collaboration

Precambrian of Garhwal Himalaya

The sections of cherts from Deoban were studied and the remains of life belonging to colonial and filamentous Cyanophyceae and referable to *Sphaerophycus* and *Gunflintia* have been recorded (with Wadia Institute of Himalayan Geology, Dehradun).

Precambrian-Cambrian Boundary—North-west Himalaya

Study of microbiota from the Precambrian-Cambrian rocks of Lolab Valley was completed. Cyanophyceae, acritarch and multicellular sheets have been identified (with P. K. Maithy and Rupendra Babu—B. S. I. P. and Gopendra Kumar and B. K. Raina, Geological Survey of India, Lucknow).

Arunachal Pradesh

The Gondwana sediments of Siang District are being studied. The occurrence of 'coal ball' and megaspores have been studied and the results are being compiled (with S. C. Srivastava and Anand-Prakash—B S. I. P. and Trilochan Singh—Wadia Institute of Himalayan Geology, Dehradun).

P-O Series

The study of sporae-dispersae recovered from P-O Series was continued (with R. S. Tiwari and Vijaya Singh—B. S. I. P. and Trilochan Singh—Wadia Institute of Himalayan Geology, Dehradun).

Malla Johar area

The study of sporae-dispersae recovered from Kalapani Limestone (Triassic), Malla Johar area has been completed and the results are being compiled (with R. S. Tiwari & Vijaya Singh—B. S. I. P. and S. Kumar and I. B. Singh—Geology Department, Lucknow University, Lucknow).

Study of Jurassic dinoflagellate cysts recovered from Ammonoid genus *Lissonia* has been taken up. Microphotography of productive samples has been done. The morphotaxonomy of the dinocyst taxa is continued (with K. P. Jain and R. Garg—B. S. I. P. and Jai Krishna—Banaras Hindu University, Varanasi).

Kachchh Basin

A first draft of manuscript, 'Palaeoecology of calcareous nannoplankton in late Jurassic shallow marine sequence of Ler Section, Kachchh, western India: Meaning of productive and barren horizons' has been prepared (with S. A. Jafar—B. S. I. P., I. B. Singh, Geology Department, Lucknow University and J. D. Howard, Skidway Institute of Oceanography, U.S.A.)

Tertiary of Zaire

Identification of about 14 fossil dicotyledonous woods from the Tertiary of Zaire was confirmed with the modern genera. A manuscript dealing with these woods is being prepared (with U. Prakash and M. B. Bande—B. S. I. P. and R. Dechamps—Museé Royal de L' Afrique Centrale, Tervuren, Belgium).

Tertiary of Palamau District, Bihar

A collection of fossil woods, leaf and flower impressions from the Palamau District, Bihar received earlier from the Geological Survey of India was further studied. The leaf-impressions were described and photographed. A paper entitled 'Fossil wood resembling *Sindora* from the Tertiary of Palamau District, Bihar' was submitted for publication (with G. P. Srivastava and U. Prakash—B. S. I. P. and V. P. Misra—Geological Survey of India).

Palynological studies on the Lower Tertiary sediments of Siang District, Arunachal Pradesh were continued. A few Lower Tertiary palynomorphs have been recorded from these samples (with S. K. M. Tripathi—B. S. I. P. and Trilochan Singh—Wadia Institute of Himalayan Geology, Dehradun).

Palynostratigraphical investigations of Subathu in Jammu and Kashmir region have been carried out. Morphotaxonomic studies of the newly recovered palynomorphs have been undertaken (with Samir Sarkar and H. P. Singh—B. S. I. P. and late A. K. Khanna—Wadia Institute of Himalayan Geology, Dehradun).

Maceration of five samples from Nainital and 20 samples from Bag Rao, Dehradun was done and the samples proved productive. The identification of recovered palynomorphs is being carried out. The occurrence of palynomorphs from the Lower Siwalik of Nainital is the first record (with H. P. Singh and A. P. Bhattacharyya—B. S. I. P. and A. C Nanda—Wadia Institute of Himalayan Geology, Dehradun).

Khasi and Jaintia Hills, Meghalaya

Coal samples from the main seam of Bapung Coalfield, Meghalaya were quantitatively analysed for their maceral contents. Selective photomicrography was also done. The study revealed that the Palaeogene (Eocene) coals are rich in vitrinite with moderate amount of exinite and low inertinite content. The

inertinite fraction is chiefly semifusinite and fungal sclerotinite. These coals are similar to the coals of Nazira Coalfield, Nagaland and Makum and Dilli-Jeypore coalfields of Upper Assam. However, they differ from coals of Nangalbibra Colliery, Garo Hills (Meghalaya) by virtue of abnormally high inertinite content in the latter. The Bapung coals have attained only low rank high volatile Bituminous C Stage (with B. K. Misra—B.S.I.P. and M. Ahmed, Geology Department, Gauhati University, Gauhati).

Siwalik coals of eastern Himalaya (Arunachal Pradesh)

Biopetrological and maturation studies of Gondwana and Siwalik (Tertiary) coals from Arunachal Pradesh are being carried out (with Anand Prakash —B.S.I.P. and Trilochan Singh—Wadia Institute of Himalayan Geology, Dehradun).

Kameng District, Arunachal Pradesh)

A paper dealing with biopetrological rank, geochemical and depositional aspects of Lower Gondwana coals from Elephant Flat area of Kameng District, Arunachal Pradesh has been submitted for publication (with B. K. Misra & G. K. B. Navale—B. S. I. P. and M. Ahmed—Geology Department, Gauhati University, Gauhati).

Arabian Sea

Palynological investigation of the five sediment cores collected by R. V. Oceanographer from the Arabian Sea was completed (with Anil Chandra—B.S.I.P. and M.G.A.P. Setty—National Institute of Oceanography, Goa).

Kerala Subsurface

Presence of Lower Eocene and Oligocene was advocated in the sub-surface Tertiary sediments of Kerala coast on the basis of palynological fossils (with R. K. Kar—B. S. I. P. and P. K. Raha and C. Rajendran—Centre of Earth Science Studies, Trivandrum).

North-East India

Palynological investigation of the Barail Sequence and Tipam-Surma units was done (with R. K. Kar—B.S.I.P. and Y. K. Mathur, K.D.M.I.P.E., O.N.G.C., Dehradun).

Indian Ocean and Andaman Islands

Palynological samples supplied from the Deep Sea Drilling Project from the Site nos. 214, 216, 217 and 218, Leg. 22 and the surface samples from the Middle Andaman Islands were partly studied (with R. K. Kar, A. Chandra and J. Mandal—B.S.I.P. and S. B. Manum, Oslo University, Oslo).

The palynology of Mesozoic sediments of the Kachchh Basin was continued. The study has been extended to eastern Kachchh and organic fossils have been recovered in good quantity. Spores, pollen, dinocysts and nannoplankton are being studied (with H. K. Maheshwari, K. P. Jain, S. A. Jafar—B.S.I.P. and S. V. Deshpande, K.D.M.I.P.E., O.N.G.C., Dehradun).

Kashmir

A paper entitled, 'Diatom analysis—Hirpur Loc. III (Lower Karewa) Kashmir Valley, India' was submitted for publication (with H. P. Gupta and Asha Khandelwal—B.S.I.P. and D. P. Agarwal—National Physical Research Laboratory, Ahmedabad).

Birbal Sahni Research Scholars

Project : *Tertiary flora of India*

Objective : *To build up the Indian Tertiary vegetation*

Detailed study of the Tertiary plant remains, both micro- and megafossils, has been undertaken. Some of the cuticles recovered from the Neyveli lignite samples compare with the cuticles of the extant genera of Lauraceae, Combretaceae, Fagaceae, Lythraceae, Oleaceae and Asclepiadaceae. A cuticle resembling

that of *Litsea* has been described and a manuscript was prepared. Palynological studies of Neyveli lignite samples were carried out and a new genus *Aspleniumsporites* gen. nov. and seven new species, viz., *Margocolporites ramanujamii* sp. nov., *Stephanocolpites venkatachalai* sp. nov., *Triporopollenites bellus* sp. nov., *Tricolpites sahii* sp., *Ericipites trivedii* sp. nov., *Symplocoipollenites raoi* sp. nov. and *Meliapollis polyconstrictus* sp. nov. have been described.

The study of fossil woods from Tripura has been undertaken. A number of fossil woods have been identified which belong to the families: Dipterocarpaceae, Leguminosae, Anacardiaceae, Combretaceae, Lythraceae, etc. Their systematic description has been completed.

Well-preserved leaf-impressions from Ranibagh near Kathgotham have been identified with *Terminalia*, *Diospyros*, *Brutonia* and *Carisa*. Their description have also been written.

Besides, maceration of coal samples from Malaya was done. The recovery of pollen, cuticles and fungal remains is encouraging. A fungus resembling *Helminthosporium* has been described.

R. K. Srivastava

Project : *Quaternary vegetational history of Loktak Lake sediments of Manipur*

Pollen analysis of the samples collected from different sites of Loktak area in Manipur was carried out. Most of the samples were acetolysed and palynologically investigated. Some samples have been proved to be barren and some yielded well preserved fossil palynomorphs in good frequency. The spore-pollen assemblage recovered from the samples confirm late-Quaternary age of the deposits.

A check-list of the extant vegetation of Manipur has been made. A total of 2,192 species, out of 1,012 genera and 213 families, were recorded covering pteridophytes, gymnosperms and

angiosperms. Pollen diagnoses of 240 species originating from dicots and monocots have been made, and a provisional pollen key has been formulated to render identification of dispersed fossil palynomorphs. Single grain preparations of fossil pollen grains and spores have been made for documentation.

Histograms and composite pollen diagrams revealed that during the time of deposition a marshy landscape prevailed in the area dominated by grasses, sedges and other herbaceous plants, perhaps originating from *Justicia*, *Impatiens*, Lamiaceae, Asteraceae, Euphorbiaceae, Urticaceae, Polygonaceae, Acanthaceae, etc. A fairly large amount of fern spores were also recorded possibly originating from *Davillia*, *Lepisorus*, *Pteris*, *Polypodium*, etc. The vegetational assemblage as reflected in the pollen diagrams reveals a rather flat floral picture without having any pronounced fluctuation of pollen curves, which indicate that the depositional environment did not suffer from severe climatic changes. The pollen diagrams from the pump house area indicate two pollen zones. The presence of a large number of arboreal pollen originating from Myrtaceae, Meliaceae, Mimosaceae, Fabaceae, Combretaceae, etc. suggests a tropical rain forest condition. The occurrence of the pollen grains of *Alnus* and *Betula*, however, does not fit in the environmental image which probably suggests that such pollen grains were transported from a higher altitude of the surrounding hills.

Partha Roy

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

Objective : *Assessment of potentialities of spore morphology and stomatogenesis for resolving the phylogenetic and taxonomic problems associated with these ferns*

The structure and ontogeny of the sporoderm of a large number of cyatheoid ferns were studied both by scanning electron

microscopy and light microscopy and thus 14 sharply defined spore forms have been recognised within these plants.

Spore morphology reveals that the genus *Culcita* as construed by Presl is a mixture of two distinct elements. The spores of one of these elements are spherical in equatorial view and are without any ridges. The exine is characterised by stout and broad spinules. These spinules mostly have enlarged tips and bear granules on their distal surface. Lateral fusion of spinules is a common phenomenon. In the other element of the genus the spores have a triangular amb which is hardly rounded. The exine is smooth to microverrucate. These findings on spores have strong support of Maxon's hypothesis that the genus *Culcita* should be divided into two natural genera, since the constant differences between them must be reflected in their nomenclature as well.

The spores of *Thyrsopteris* closely resemble those of *Culcita macrocarpa* group. They are, however, unlike those of *Cibotium* and *Dicksonia*. Spores of *Dicksonia* appear diverse, some of them having reticulate exine and granulate perispore while others having psilate exine and inconspicuous perispore. This difference in spore morphology, however, finds no correlation with other properties of the taxon. The perispores of *Metaxya* and *Cibotium* are fragile, yet they show striations similar to those of some dennstaedtioid ferns.

The spores of *Cyathea* show wide variations. But the structural diversities in them are interconnected by transitional types. The variation in the properties of spores of *Cyathea* probably indicates that the genus is highly evolutive and that some recent taxa of dennstaedtioid affinity were derived from it. Ontogeny of spores suggests such a probability.

Ontogenetic studies reveal that immediately after separation from the meiotic tetrad condition, the developing spores of *Cyathea*, *Dicksonia*, *Culcita*, *Cibotium* and *Cnemidaria* remain surrounded by

the tapetal fluid in an irregular manner. The exine of such spores appears smooth. Protecting coverings with various isolated or fused ornamental elements develop evidently through the opposition of wall material in the form of granules, which later may develop as microverrucae, verrucae, ridges or spines.

Surajit Chakraborty

Theses Submitted

During the period under review the following Ph.D. theses were submitted.

Chanchala	:	"Wild plant remains from the archaeological sites—A palaeobotanical, palaeoecological and palaeoethnobotanical study".
Madhav Kumar	:	"Palynostratigraphy of the Tertiary sediments in north-east India".
Omprakash S. Sarate	:	"Palynostratigraphical studies on some Lower Gondwana coals from Satpura Basin, M.P., India".
R. C. Mehrotra	:	"Further contribution to the knowledge of the Deccan Intertrappean flora of India".
Ram Awatar	:	"Palynostratigraphic studies in Johilla Coalfield, South Rewa Gondwana Basin, Central India".

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Udar, R. & Gupta, Asha (1984). A new *Riccia* (Mich.) L. from Deoban, western Himalayas, India, pp. 307-311 in: *Proc. V Indian Geophytological Conference, Lucknow (1983), Special Publication.* The Palaeobotanical Society, Lucknow.

Field Work

1. Field excursions were undertaken to collect the samples for microbiota, stromatolites and other biogenic remains (P. K. Maithy, G. Rajagopalan, Kedar Narain, Ravi Misra and A. Sarkar).

2. Palynological samples were collected from the Blaini-Krol of Nainital (Bijai Prasad).

3. A collection of fossil and modern algae was made from Kachchh (P. K. Misra).

4. A good collection of charts was made from the Deoban-Chakrata region (Manoj Shukla).

5. An excursion was undertaken for the collection of plant megafossils from Kachchh (Jayasri Banerji).

6. Leaf-impressions and petrified and carbonised woods were collected from the Tertiary of Rajasthan and Gujarat (J. S. Guleria).

7. Leaf-impressions were collected from the Siwalik beds of Koilabas, Nepal (Uttam Prakash and Mahesh Prasad).

8. Carbonised woods and leaf-impressions were collected from the Neyveli lignite mine I and II, Neyveli (Anil Agarwal).

9. Leaf-impressions were collected from the Tertiary sediments of Oodlabari and adjoining area, North-west Bengal and from near Cherra Punji, Meghalaya (Krishna Ambwani and J. S. Antal).

10. A good collection of achaeobotanical material was collected from Marhan, District Gorakhpur, Uttar Pradesh (K. S. Saraswat).

11. A collection of palynological samples was made from Garhwal Syncline, Lesser Himalaya (R. S. Tiwari).

12. A field excursion was undertaken to collect the palynological samples from Rajmahal hills and Raniganj Coalfield, Bihar (K. L. Meena).

13. Palynological samples were collected from Kachchh and Rajasthan localities (B. N. Jana).

14. Palynological samples were collected from the South Rewa and Athgarh areas (B. N. Jana and Ram Awatar).

15. A field excursion was undertaken to collect the bore-hole core samples from Tripura (R. K. Kar).

16. A collection of palynological samples was made from Silchar, Half Long, Sonapur, Badarpur and adjacent localities (R. K. Kar and R. S. Singh).

17. A field excursion was undertaken to collect the palynological samples from Ledo Colliery, Assam (R. K. Kar, Madhav Kumar and B. D. Mandaokar).

18. A field excursion was undertaken to various areas of South Andaman, Baratang Island and Middle Andaman and about 200 rock samples were collected from different traverses (Anil Chandra & J. Mandal).

19. An excursion was undertaken to visit the Mussoorie Syncline area from Maldeovta to Dhanaulti and examined the exposures of various rock formations. The top of Tal and suspected Subathu exposures near Gopi Chand Ka Mahal were interesting for the palynological studies (H. P. Singh).

20. Palynological samples were collected from Tertiary and Jurassic of Kachchh areas, viz., Naredi Formation, Harudi Formation, Fulra Limestone Formation, Maniara Fort Formation, Khari Nadi Formation, Vinjhan Shale Formation and Basal Member of Jhuran Formation exposed at Ler Village (S. A. Jafar, R. K. Saxena and Jyotsana Rai).

21. A good collection of glauconite and quartzite samples was made from the Rohtas mountains for Fission-Track dating (P. K. Maithy and G. Rajagopalan).

22. Coal samples from the exposures and bore-core samples from Ramgarh Coalfield, C.M.P.D.I.L., Ranchi and C.F.R.I., Dhanbad were collected. These samples belong to Barakar and Raniganj formations of the Lower Gondwana Sequence (G. K. B. Navale and Rakesh Saxena).

Papers read at Symposia/Conferences/ Meetings, etc.

Archana Tripathi—Palynological evidence for Raniganj Stage in the Rajmahal Basin, Bihar. XI Indian Colloquium on Micropalaeontology and Stratigraghy, Department of Geology, Calcutta University, Calcutta.

Asha Khandelwal—Aeropalynological investigations at Lucknow. II Aerobiological Conference, Birbal Sahni Institute of Palaeobotany, Lucknow.

Garud K. B. Navale—On the intercorrelation of coal seams of Gondwana coalfields of India. National Working Group for Global correlation of coal seams, Indian School of Mines, Dhanbad.

Gyanendra K. Trivedi—Palynology of the Kopili Formation (Upper Eocene) exposed along Jowai-Badarpur Road, Meghalaya. VII All India Botanical Conference, Jaipur.

Kripa S. Saraswat—Plant economy at ancient Narhan (C. 700 B.C. to 400 A.D.). XVI Annual Conference of Indian Archaeological Society, Gauhati University, Gauhati.

Sayed A. Jafar—Discovery of mixed coccoliths from Baratang Island, India and its bearing on the regional palaeogeography. XI Indian Colloquium on Micropalaeontology and Stratigraphy, Calcutta.

Sayed A. Jafar and Jyotsana Rai—Late Middle Eocene calcareous nannoplankton from Kachchh, western India. XI Indian Colloquium on Micropalaeontology and Stratigraphy, Calcutta.

Sayed A. Jafar and R. K. Saxena—Late Bathonian calcareous nannoplankton from basal part of Jhumara (Chari) Formation Kachchh, western India. XI Indian Colloquium on Micropalaeontology and Stratigraphy, Calcutta.

Vijaya Singh—Palynological evidences for Permo-Triassic boundary in Raniganj Coalfield, Damodar Basin, India. XI Indian Colloquium on Micropalaeontology and Stratigraphy, Department of Geology, Calcutta University, Calcutta.

Lectures given Outside the Institute

Annamraju Rajnikanth—Pollution. J. N. Degree College, Lucknow.

Govindraja Rajagopalan—Dating Method. Trainees of UNESCO sponsored training course in conservation of cultural property.

Jaswant S. Guleria—Tertiary megaflora of India. Museum of Natural Sciences, Berlin, East Germany.

Mohan B. Bande—Early Tertiary plant fossils of India. Musee Royal de'L Afrique Centrale, Tervuren, Belgium.

Mohan B. Bande—Plant fossils—What do they tell us? Holkar Science College, Indore, Madhya Pradesh.

Mohan B. Bande—Early Tertiary climate and palaeogeography of Central India in the light of Deccan Intertrappean flora. Botanical Department, Hungarian Natural History Museum, Budapest, Hungary.

Sukh Dev—Evaluation of *in-situ* spores and pollen grains from the Jurassic-Cretaceous fructifications. Department of Astronomy and Earth Sciences, Tokyo, Gakugei University, Japan.

Training Provided to Outsiders

Dr H. De and Dr K. R. Chowdhary of Biren Roy Research Laboratory for Archaeological dating, Jadavpur University were given training in processing of samples for Radiocarbon dating.

Smt. S. Chakraborty, Geologist, Geological Survey of India was given training on palynological studies.

Dr K. K. Mukherjee, Geology Department, Concordia University, Montreal, Canada was provided training in biopetrology and microphotometery (rank determination) on coals and lignites.

Shri K. N. Singh, Geology Department, Banaras Hindu University, Varanasi was imparted training in biopetrology, photomicrography and microphotometry on Palaeozoic coals of the Johilla Coalfield.

Technical Assistance to Outsiders

Geological Survey of India

Bore-core samples from Rajmahal Basin, Raniganj Coalfield, Talchir Coalfield and Birsinghpur Pali Coalfield have been palynologically dated and the reports have been communicated.

One shale sample from G. S. I., Lucknow; four wood samples from G. S. I., Shillong; and two coral samples from G.S.I., Vishakhapatnam were studied.

Central Mining, Planning and Designing Institute, Ranchi

Rank evaluation of coal samples from East Bokaro, Ramgarh and Raniganj coalfields is being done.

Neyveli Lignite Corporation, Tamil Nadu

Detailed study on the nature and composition of main lignite seam from various sections and mines as well is being carried out.

Wadia Institute of Himalayan Geology, Dehradun

Some Gondwana and Siwalik coal samples from eastern Himalayas of Arunachal Pradesh were analysed and the results are being compiled.

Archaeological Survey of India

Radiocarbon dating of eight charcoal samples was done. The palynological analysis of 30 samples from Lakshadweep Islands was carried out, of which only two samples yielded pollen of grasses, sedges and palms.

Deccan College, Pune

Radiocarbon dating of 12 charcoal samples, five shell samples and one clay sample was carried out and the results were communicated.

Banaras Hindu University, Varanasi

Nine charcoal samples sent by the Department of Ancient Indian History and Culture were dated by Radiocarbon method.

Tamil University, Tanjavur, Tamil Nadu

Radiocarbon dating of four charcoal samples sent by the Department of Epigraphy was done.

Directorate of Archaeology and Museum, Andhra Pradesh

Three charcoal samples sent to us were dated by Radiocarbon method.

Oil and Natural Gas Commission, Dehradun

Radiocarbon dating of 11 calcareous sediment samples was done and the results were communicated.

Advance Centre for Earth Sciences, Trivandrum

Two peat and two lignite samples were dated by Radiocarbon method.

University of Calcutta, Calcutta

Radiocarbon dating of three wood and four peat samples sent by the Department of Botany was done.

University of Godansk, Poland

Radiocarbon dating of two peat samples was done and the results have been communicated to Prof. Bohdziewicz.

International Commission for Coal Petrology

Three oil shale samples were analysed for global comparison of dispersed organic matter (DOM) types and maturity (by reflectance and fluorescence techniques). The results have been communicated.

Central Ground Water Board

Maceration of 10 palynological samples from Unnao District was done but all of them proved barren.

Deputation/Training/Study Abroad

J. S. Guleria

He visited various Museums, Laboratories, Institutes, Botanical Gardens and fossil localities of the German Democratic Republic under the Indo-GDR Science and Technology Collaborative Exchange Programme from 12th June to 12th September, 1984. During the period he acquainted himself with various techniques, preparation of cuticular slides of living as well as fossil material, and studied a number of specimens of the Tertiary plants of GDR. From 12th September to 19th September, 1984, Dr Guleria visited the Palaeobotany Laboratory of University of Claud-Bernard, Museum de Histoire Naturelle and Botanical Gardens at Paris. At Lyon he worked with Prof. Y. Lemoigne and Dr E. Samuel on a collection of Tertiary plants of France, Ethiopia and Nepal and made some fruitful discussions. From there he went to U. K. and visited the British Museum of Natural History, London; Royal Botanic Gardens and Jodrell Laboratory of Wood Anatomy, Kew in England.

Jayasri Banerji

She visited Lyon, Strasbourg and Paris in France from 1st September to 30th September, 1984. At Lyon she worked in the Palaeobotany Laboratory of Claude Bernard University and examined various specimens of Jurassic flora of France, Mesozoic flora of Columbia and Lower Cretaceous flora from Spain. Cuticular feature of a new species of the genus *Allocladus* Townrow from Salt Range, Pakistan was also studied under Scanning Electron Microscope. Besides, she visited two fossiliferous

localities at Jura Mountain, a herbarium, fossil collection of the Geology Department, State Museum and Botanical Garden, Lyon. At Strasbourg, she visited the Palaeobotany Laboratory of the Institute of Geology and Palaeontology and examined the Triassic fossil plants and animals from Vosges. At Paris, Dr Banerji visited the Palaeobotany Laboratory of the University of Paris and examined some Mesozoic plants collected from Columbia and Iran. At the Museum National de' Histoire Naturelle, Paris, she also examined some of the type specimens of Saporta and other collections.

M. B. Bande

He visited Hungary from 17th February, 1985 to 17th March, 1985 under the INSA-Hungarian Academy of Sciences, Budapest Exchange Programme. He worked at the Botanical Department, Hungarian Natural History Museum, Budapest; Department of Botany, University of Szeged; and the Hungarian Geological Institute, Budapest Thereafter, he visited Senkenberg Museum, Frankfurt, West Germany and Laboratories de Paleobotanique, University of Paris, France. From 22 March to 29 March, 1985 Dr Bande worked with Mr R. Dechamps, Incharge, Wood Anatomy Division, Museé Royal de' L Afrique, Centrale, Tervuren, Belgium to accomplish the collaborative research work.

Sukh Dev

He visited Japan from 2nd November to 29th November, 1984 under the exchange programme of the Indian National Science Academy and Japan Society for the Promotion of Science. At the Tokyo Gakugei University he examined the Mesozoic flora of Japan with Professor T. Kimura. Dr Sukh Dev also visited Tokyo University and Waseda University at Tokyo, various museums and herbaria at Tokyo, Kochi, etc. and had fruitful discussions with the palaeobotanists of Japan regarding the Mesozoic flora. He also undertook four field excursions and visited various fossiliferous localities in Japan.

Publication and Information Section

Publication

During the year numbers 1, 2 and 3 of volume 32 of the journal, *The Palaeobotanist* were published. Besides, the next Volume 33 of The Palaeobotanist, which stands for the year 1984, was also published. Thus with the publication of this Volume 33, the journal has become to-date.

The manuscripts of numbers 1 and 2 of the next Volume 34 of The Palaeobotanist were also edited and sent to Press for printing.

The 13th Birbal Sahni Memorial Lecture entitled "Plants, animals and time" delivered by Prof. W. G. Chaloner, University of London, U. K. was published.

Both Hindi and English versions of the Annual Report for the year 1983-84 were compiled, translated and published. The printed copies were also sent to various universities, libraries, institutions and colleges.

This year an income of Rs. 92,541.30 was registered from the sales proceeds of the Institute publications. This sum includes the following foreign exchange earnings.

US $ = 5799.80

£ = 827.10

During the period under review a 'Binding Unit' was also established for binding the reports, books and journals of the Institute Library. The preparation of slide-trays for the scientists and hard board boxes for Museum, etc. have also been taken up by the unit.

Library

During the year the 'Stock Position' of Library is as follows:

Particulars	Position on 31.3.1984	Additions during 1984-1985	Total
Books	3862	89	3951
Journals	7807	47	7854
Reprints	29214	698	29912
Microfilm/fiche	289	—	289
Theses	44	9	53
Reports	45	—	45
Maps and Atlases	46	2	48
Reference Books	154	3	157

In addition to above, 90 current periodicals were also subscribed in the Library. This year the total number of registered borrowers has gone up to 144.

Exchange Programme

(*i*) Number of research papers whose reprints were purchased for exchange 74

(*ii*) Total number of reprints sent out on exchange .. 400

(*iii*) Number of institutions on exchange 58

(*iv*) Number of individuals on exchange 417

(*v*) Set of papers of Professor Birbal Sahni sent .. 5

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

3. Current Awareness Service

(*i*) A quarterly list of new additions to the Library like books, reprints and journals as well as titles called

from Journals was compiled in order to keep readers in touch with the latest acquisitions. A copy of each issue was distributed to each department of the institute and Botany/Geology Departments of many other Indian Universities.

In addition to the staff of the Institute, the Library services were availed by a number of scientists from various organisations/ institutions in India and abroad. Some of the important institutions universities or organisations are: Maharashtra Association for the Cultivation of Sciences, Pune; Wadia Institute of Himalayan Geology, Dehradun; Post Graduate Centre in Botany, Jamshedpur; National Institute of Oceanography, Dona Paula; Geological Survey of India, Lucknow; University of Mysore, Mysore; University of Jodhpur, Jodhpur; University of Garhwal, Srinagar; University of Calcutta, Calcutta; University of Lucknow, Lucknow; National Botanical Research Institute, Lucknow; Industrial Toxicology Research Centre, Lucknow; King George Medical College, Lucknow; and Michigan State University, Michigan.

Museum

A write up on the Institute's Museum was written for distribution to the visitors. Photographs of the main panel of the Central Hall of the Institute were got laminated. Under a special programme 'Palaeobotany for Education Programme' a number of fossil specimens/slides were sent to eight educational institutions of the country. Fossil specimens as gift/exchange were also sent to various centres in U.S.A., Belgium and France. Some specimens were also received in the Museum from Canada, U.S.A. and Estonia.

Fossil Store

Fossil specimens/samples collected by the Institute staff as well as received from various other organisations for investigations were properly numbered and kept in polythene bags.

Type and Figured Specimens/Slides/Negatives

This year specimens/slides/negatives of 44 research papers were submitted to the repository of Museum. Megafossils and palynological slides of the repository were segregated. The position of type and figured specimens/slides/negatives as on 31st March 1985 is as under:

Type and figured specimens	3948
Type and figured slides	8624
Negatives of above	9655

New Collections from India

The departmentwise details of the samples/specimens collected by the scientific staff from various localities are as follows:

	Samples	*Specimens*
1. Department of Non-Vascular Plants	—	909
2. Department of Mesophytic Evolutionary Botany	17	316
3. Department of Cenophytic Evolutionary Botany	5	565
4. Department of Quaternary Biogeography & Archaeobotany	12	—
5. Department of pre-Gondwana & Gondwana Palynostratigraphy	188	—
6. Department of Post-Gondwana Palynostratigraphy of Peninsular India	1153	4
7. Department of Planktonology	542	—

8.	Department of Biodiagenesis	21	—
9.	Under collaborative projects with ONGC	385	—

New Collections from abroad

1. Field Museum of Natural History, Chicago, Illinois, U.S.A. — 9 specimens & 9 peel sections

2. With the courtesey of the organisers of I.O.P. Conference, Edmonton, Canada — 2 specimens

3. From Estonia through Dr S. A. Jafar — 2 specimens

Fossil specimens sent abroad

1. Dr P. R. Crane, Field Museum of Natural History, Chicago, Illinois, U.S.A.

2. Professor Pierart, University de L'etat a mons, Faculte de Medicine Avenue du Champ de mars 24 Mons, Belgique

3. Professor A. T. Cross, Department of Geological Science, Michigan State University, East Lancing, Michigan, U.S.A.

Specimens/samples received for investigation

1. Geological Survey of India .. .. 74 samples

2. Central Ground Water Board, Unnao .. 109 samples

Presentation of fossil specimens to various institutions in the country under "Palaeobotany for Education Programme"

1. Department of Botany,
   Atarra College,
   Atarra, Banda, U.P.
2. Department of Geology,
   J. B. College,
   Jorhat, Assam
3. Jogmaya Devi College,
   Calcutta, West Bengal
4. Kishori Raman P. G. College,
   Mathura, Uttar Pradesh
5. Tata College Campus,
   Ranchi University,
   Chaibasa, Bihar
6. Govt. Post Graduate College,
   Dharamshala, Himachal Pradesh
7. Burdwan Railway Vidyapeeth,
   Burdwan, West Bengal
8. Centre of Advanced Studies in Geology,
   Punjab University,
   Chandigarh

Others

1. Wadia Institute of Himalayan Geology,
   Dehradun, Uttar Pradesh
2. Bose Institute,
   Calcutta, West Bengal
3. Professor K. M. Gupta,
   Ajmer, Rajasthan

4. Dr H. B. Srivastava,
   Varanasi, Uttar Pradesh

5. Dr Sunirmal Chanda,
   Bose Institute,
   Calcutta, West Bengal

6. Professor Yashpal,
   Secretary,
   Department of Science and Technology,
   New Delhi

Visitors during the year

This year a record number of visitors paid a visit to the Museum. Citizens of U.S.A., U.S.S.R., China, France, West Germany and Czechoslovakia and delegates of Indian Science Congress Session were among the important visitors, in addition to the students and teachers of the following institutions/organisations or departments.

1. Botany Department, Burdwan University, Burdwan, West Bengal

2. Botany Department, Lucknow University, Lucknow, Uttar Pradesh

3. Geology Department, Ranchi University, Ranchi, Bihar

4. Geology Department, Ranchi University, Chaibasa, Bihar

5. Botany Department, Cotton College, Gauhati, Assam

6. Museology Department, M. S. University, Baroda, Gujarat

7. Botany Department, Presidency College, Calcutta, West Bengal

8. Botany Department, Govt. Post Gradudate College, Balaghat, Madhya Pradesh
9. Botany Department, Surendra Nath College, Calcutta, West Bengal
10. Botany Department, Magadh University, Gaya, Bihar
11. Botany Department, G. F. College, Shahjahanpur, Uttar Pradesh
12. Botany Department, Osmania University, Kothagudem, Andhra Pradesh

Herbarium

During the period under review the following additions were made.

Details	Position on 31.3.84	Addition during the year	Total as on 31.3.85
Herbarium sheets	10,621	8	10,629
Wood specimens	3,477	21	3,498
Pollen slides	10,594	30	10,624
Wood slides	3,939	12	3,951

The routine work of labelling, indexing, poisoning, mounting and rearranging of plant specimens, issue and return of herbarium material for research work, etc. was done. Systematic display of herbarium material was made during the Annual Session of the Indian Science Congress, held in Lucknow.

Facilities

Following research workers of various organisations/ institutions consulted the herbarium for their research work.

1. Mr Rajiv Srivastava,
   Birbal Sahni Research Scholar,
   Botany Department,
   Lucknow University, Lucknow

2. Mr Sharad Bajpai,
   Research Scholar,
   Botany Department,
   Lucknow University, Lucknow

3. Mrs Shampa Chakravarty,
   Geological Survey of India,
   Niralanagar, Lucknow

Material received from :

1. The Officer-In-Charge, — 7 wood specimens
   Wood Anatomy Branch,
   F. R. I., Dehradun

2. Professor Zhou Yin, — 14 wood specimens
   The Institute of Wood Anatomy,
   The Chinese Academy of Forestry,
   Wan Shou Shaw,
   Beijing, China

Material sent to:

1. The Officer-In-Charge, — 4 wood specimens
   Wood Anatomy Branch,
   F. R. I., Dehradun.

Distinguished Visitors

1. Dr L. Xingxue & Zhou-Zhiyan, Nanjing Institute of Geology & Palaeontology, Nanjing, China.

2. Prof. Y. Lemoigne, University Claude-Bernard, Lyon, France.

3. Dr M. S. Ansari, Pharmacological Lab for Indian Medicines, Ghaziabad, U. P.

4. Prof. K. V. Raman, Ancient History & Archaeology Department, University of Madras, Madras, Tamil Nadu.

5. Prof. B. N. Srivastava, Head, Department of Ancient Indian History and Archaeology, Lucknow University, Lucknow.

6. Dr V. Korovikov, 4/22 Shantiniketan, New Delhi, 'Pravada' Moscow Correspondent.

7. Prof. A. K. Medda, Bose Institute, Calcutta, Bengal.

8. Shri A. K. Banerjee, Deputy Secretary, Government of India, Ministry of Finance, New Delhi.

9. Prof. Sudhir Prasad, Hazaribagh, Bihar.

10. Prof. A. K. Saha, Zoology, Department, Kalyani University, Kalyani, West Bengal.

11. Dr Helmut Lieth, Biology Department, Osnabruk University, D-4500 Osnabruck, West Germany.

12. Prof. Josef Joros, Department of Geology, Charles University, Prague, Czechoslovakia.

13. Prof. A. T. Cross, Michigan State University, Michigan, U.S.A.

14. Dr V. V. LaMarche Jr. and Dr F. W. Telewsky, University of Arizona, Tucson, Arizona, U.S.A.

15. Prof. S. C. Lahiri, Jadavpur University, Calcutta, West Bengal.

16. Prof. Yashpal, Secretary, Department of Science & Technology, Government of India, New Delhi.

17. Dr R. S. Negi, National Museum of Man, Bhopal, M. P.

18. Dr V. V. B. Subba Rao, Director, Department of Science & Technology, New Delhi.

Founder's Day Celebrations

The Birthday of Professor Birbal Sahni, F. R. S. was celebrated on 14th November, 1984. In the morning at 8.30 a.m. the wreaths and flowers were placed on the '*Samadhi*' of Professor Birbal Sahni by Shrimati Savitri Sahni, Staff of the Institute and several other distinguished persons. In the evening, the '*Samadhi*' was decorated by flowers and garlands.

At 4.30 p.m. the 31st Sir Albert Charles Seward Memorial Lecture entitled "The aspects of Palaeobotany under discussion today" was delivered by Prof. Y. Lemoigne, Botany Department, University of Lyon, France.

On 27th November, 1984 at 4 00 p m the 14th Birbal Sahni Memorial Lecture entitled "On the mixed Permian floras of Gondwana and Cathaysia or Euramerica" was delivered by Prof. Li Xingxue, Nanjing Institute of Geology and Palaeontology, Academia Sinica, Nanjing, China.

On 5th January 1985 at 3.00 p.m. the 32nd Sir Albert Charles Seward Memorial Lecture entitled "The fossil plant record : Significant biases and assumptions effecting interpretations" was delivered by Prof. Aureal T. Cross, Department of Geological Sciences, Michigan State University, Michigan, U.S.A.

Visiting Scientist

Professor Aureal T. Cross from the Geology Department, Michigan State University, Michigan (U.S.A.) visited the Institute as a "Visiting Scientist" from 27th December, 1984 to 3rd March,

1985. On 5th January, 1985 Prof. Cross delivered the 32nd Sir Albert Charles Seward Memorial Lecture entitled "The fossil plant record: Significant biases and assumptions affecting interpretations". Besides, he delivered a number of lectures in various departments/institutions like Geology Department, Lucknow University; Wadia Institute of Himalayan Geology, Dehradun; Oil and Natural Gas Commission, Dehradun; Bose Institute, Calcutta; University of Calcutta, Calcutta; and Department of Botany, University of Delhi, Delhi. During his stay he also had fruitful scientific discussions in several departments of the Institute. In addition, a number of scientists from various departments discussed various problems pertinent to their research work with him. He also undertook a field trip to north-western part of Mussoorie Syncline with Dr. V. C. Thakur, Dr. S. C. D. Sah, Dr. H. P. Singh, Dr. N. S. Mathur, Dr. V. C. Tewari, Dr. R. A. K. Srivastava and Dr. B. S. Venkatachala.

Other Foreign Distinguished Scientists

Professor Y. Lemoigne

Professor Y. Lemoigne of the Department of Botany, University of Lyon, France visited the Institute on 13th November, 1984 and delivered the 31st Sir Albert Charles Seward Memorial Lecture entitled "The aspects of palaeobotany under discussion today". Thereafter, he alongwith Dr. J. S. Guleria and Dr. B. N. Jana went on field excursions of Rajasthan and Kachchh (Gujarat). While on the way, he also visited the Palaeobotanical Laboratory of the Department of Botany, Jodhpur University and delivered a lecture there. Then from 21st November, 1984 to 5th December, 1984 he visited a number of fossil localities around Jaisalmer, Barmer and Bhuj.

Professor Li-xingxue and Dr. Chow

Professor Li-Xingxue and Dr. Chow from the Nanjing Institute of Geology and Palaeontology, Academia Sinica, China visited the Institute under Indo-Chinese Exchange Programme.

On 27th November, 1984 Prof. Li-Xingxue delivered the 14th Birbal Sahni Memorial Lecture entitled "On the mixed Permian floras of Gondwana and Cathaysia or Euramerica" at the Institute. Thereafter from 1st to 5th December, 1984 Prof. Li-Xingxue and Dr. Chow with Dr. P. K. Maithy and Dr. Bijay Prasad went to see the Archean rock exposures around Mahoba and Vindhyans exposed around Chitrakoot.

The Staff

(As on 1st April, 1984)

Director

Dr M. N. Bose, M.Sc., Ph.D., F.Pb.S., Correspondent de la Arsom, F.A.Sc., F.N.A.

Distinguished Scientist

Dr R. N. Lakhanpal, M.Sc., Ph.D., F.B.S., F.Pb.S., F.N.A.Sc., F.A.Sc., F.N.A.

Department of Non-Vascular Plants

Dr P. K. Maithy, M.Sc., Ph.D. (A.D.)
Dr Pramod Kumar, M.Sc., Ph.D. (S.S.O.)
Dr Manoj Shukla, M.Sc., Ph.D. (J.S.O.)
Dr Bijai Prasad, M.Sc., Ph.D. (J.S.O.)
Sri Rupendra Babu, M.Sc. (J.S.A)
Sri Kalyan Lal Meena, M.Sc. (J.S.A)
Dr P. K. Misra, M.Sc., Ph.D. (J.S.A.)

Department of Palaeophytic Evolutionary Botany

Dr Hari K. Maheshwari, M.Sc., Ph.D., F.P.S. (A.D.)
Dr (Smt.) Shaila Chandra, M.Sc., Ph.D., F.L.S. (A.D.)
Dr A. K. Srivastava, M.Sc., Ph.D. (J.S.O.)
Dr (Smt.) Usha Bajpai, M.Sc., Ph.D. (J.S.O.)
Sri Kamal Jeet Singh, M.Sc. (J.S.A.)
Smt. Rajni Tiwari, M.Sc. (J.S.A.)
Sri V. K. Singh, M.Sc. (J.S.A.)

Department of Mesophytic Evolutionary Botany

Dr Sukh Dev, M.Sc. (Hons.), Ph.D. (Lucknow), Ph.D. (Reading) (A.D.)
Dr Shyam C. Srivastava, M.Sc., Ph.D. (S.S.O)
Dr (Kumari) Jayasri Banerji, M.Sc., Ph.D. (S.S.O.)
Dr P. K. Pal, M.Sc., Ph.D. (J.S.O.)
Smt. Rashmi Srivastava, M.Sc. (J.S.A.)
Sri A. Rajnikanth, M.Sc. (J.S.A.)
Kumari Neeru Pandya, M.Sc. (J.S.A)
Sri S. R. Manik, M.Sc. (J.S.A.)

Department of Cenophytic Evolutionary Botany

Dr Uttam Prakash, M.Sc., Ph.D., F.Pb.S. (A.D.)
Dr N. Awasthi, M.Sc., Ph.D. (A.D.)
Dr M. B. Bande, M.Sc., Ph.D. (S.S.O.)
Dr K. Ambwani, M.Sc., Ph.D. (J.S.O.)
Dr J. S. Guleria, M.Sc., Ph.D. (J.S.O.)
Dr Anil Agarwal, M.Sc., Ph.D. (S.S.A.)
Sri R. C. Mehrotra, M.Sc. (J.S.A.)
Sri Mahesh Prasad, M.Sc (J.S.A.)

Department of Quaternary Biogeography & Archaeobotany

Dr Vishnu Mittre, M.Sc., Ph.D. (Lucknow), Ph.D. (Cantab), (Deputy Director)
Dr H. P. Gupta, M.Sc., Ph.D. (A.D.)
Dr (Smt.) Chhaya Sharma, M.Sc., Ph.D. (S.S.O.)
Dr K. S. Saraswat, M.Sc., Ph.D. (S.S.O.)
Dr A. Bhattacharya, M.Sc. (S.S.A.)
Dr R. R. Yadav, M.Sc., Ph.D. (J.S.O.)
Dr (Smt.) Asha Khandelwal, M.Sc., Ph.D. (J.S.O.)
Kumari Aruna Sharma, M.Sc. (J.S.O.)
Kumari Chanchala, M.Sc. (S.S.A.)
Sri Samir Kumar Bera, M.Sc. (J.S.A.)
Sri Mohan Singh Chauhan, M.Sc. (J.S.A.)

Department of Pre-Gondwana and Gondwana Palynostratigraphy

Dr R. S. Tiwari, M.Sc., Ph.D. (A.D.)

Dr S. C. Srivastava, M.Sc., Ph.D. (S.S.O.)
Dr (Smt.) Archana Tripathi, M.Sc., Ph.D. (J.S.O.)
Dr B. N. Jana, M.Sc., Ph.D. (J.S.O.)
Dr (Smt.) Vijaya Singh, M.Sc., Ph.D. (J.S.O.)
Smt. Neerja Jha, M.Sc. (S.S.A.)
Sri Ram Awatar, M.Sc. (J.S.A.)
Sri Kindu Lal Meena, M.Sc. (J.S.A.)

Department of Post-Gondwana Palynostratigraphy of Peninsular India

Dr R. K. Kar, M.Sc., Ph.D. (A.D.)
Dr Anil Chandra, M.Sc., Ph.D. (S.S.O.)
Dr J. P. Mandal, M.Sc., Ph.D. (J.S.O.)
Dr R. S. Singh, M.Sc., Ph.D. (J.S.O.)
Sri Madhav Kumar, M.Sc. (J.S.A.)
Sri B. D. Mandaokar, M.Sc. (J.S.A.)
Sri G. K. Trivedi, M.Sc. (J.S.A.)

Department of Post-Gondwana Palynostratigraphy of Extra-Peninsular India

Dr Haripall Singh, M.Sc. (Hons.), Ph.D. (A.D.)
Dr R. K. Saxena, M.Sc., Ph.D. (J.S.O.)
Dr S. K. M. Tripathi, M.Sc., Ph.D. (S.S.A.)
Dr M. R. Rao, M.Sc., Ph.D. (J.S.O.)
Dr Samir Sarkar, M.Sc., Ph.D. (J.S.O.)
Dr (Kumari) Asha Gupta, M.Sc., Ph.D. (J.S.A.)
Dr A. P. Bhattacharya, M.Sc., Ph.D. (J.S.A.)

Department of Planktonology

Dr K. P. Jain, M.Sc., Ph.D. (A.D.)
Dr. S. A. Jafar, M.Sc., FPTC (Vienna), Dr. phil. nat. (West Germany)
Dr Rahul Garg, M.Sc., Ph.D. (S.S.A.)
Sri K. Ateequazamman, M.Sc. (J.S.A.)
Sri R. K. Saxena, M.Sc. (J.S.A.)
Smt. Jyotsana Rai, M.Sc. (J.S.A.)

Department of Biodiagenesis

Dr G. K. B. Navale, M.Sc., Ph.D., F.G.S., B.G.M.S., F.I.A.S. (A.D.)
Dr Anand Prakash, M.Sc., Ph.D. (S.S.O.)
Dr B. K. Misra, M.Sc., Ph.D. (J.S.O.)
Dr Rakesh Saxena, M.Sc., Ph.D. (J.S.O.)
Kumari Alpana Agarwal, M.Sc. (J.S.A.)
Sri O. S. Sarate, M.Sc. (J.S.A.)
Sri B. D. Singh, M.Sc. (J.S.A.)

Department of Radiometric Dating

Dr G. Rajagopalan, M.Sc., Ph.D. (Germany), (A.D.)
Dr H. S. Saini, M.Sc., Ph.D. (J.S.O.)
Sri A. P. Srivastava, M.Sc. (J.S.A.)

Publication and Information Section

Publication

Sri Jaswant Singh, M.Sc. (Joint Editor)

Library

Sri J. N. Nigam, B.A., B.Lib.Sc. (Librarian)
Sri G. K. Gupta, B.Sc., B.Lib.Sc. (Library Assistant)
Kumari Kavita Sangal, B.Sc., B.Lib.Sc. (Library Assistant)
Sri Jagannath Prasad, B.A. (L.D.C.)

Museum

Sri G. P. Srivastava, M.Sc. (Curator)
Sri N. C. Saxena, B.A. (Museum Assistant)
Sri Prem Prakash, B.Sc. (Jr. Museum Assistant)
Sri S. R. Yadav, B.A. (Fossil Cataloguer)

Herbarium

Dr H. A. Khan, M.Sc., Ph.D. (S.S.O.)
Sri J. C. Srivastava, M.Sc. (Herbarium Incharge)
Sri Diwakar Pradhan, B.Sc. (Herbarium Incharge)
Sri A. K. Singh Rathore, B.Sc., B.Lib.Sc. (Herbarium Incharge)

Laboratory Services

Sri H. N. Boral, B.Sc. (J.T.O.)
Sri B. Sekar, B.Sc., A.I.C. (S.T.A.)
Smt. Asha Guleria, B.Sc. (S.T.A.)
Smt. Madhabi Chakraborty, B.Sc. (S.T.A.)
Smt. Indra Goel, B.Sc. (S.T.A.)
Sri D. C. Joshi, B.Sc. (J.T.A.)
Kumari Kamla, Amarlal, B.Sc. (S.T.A)
Sri I. J. Mehra, B.A. (Lab. Assistant)
Sri T. K. Mandal, B.Sc. (J.T.A.)
Sri E. G. Khare, B.Sc. (J.T.A.)
Smt. Sangita Gupta, B.Sc. (J.L.A.)
Sri A. K. Srivastava, B.Sc. (Lab. Assistant)
Smt. Reeta Banerjee, B.Sc. (Lab. Assistant)
Sri Keshav Ram (J.L.A.)
Sri Chandra Pal, B.Sc. (J.L.A.)
Sri V. P. Singh, B.Sc. (Lab. Assistant)
Sri R. C. Misra, B.Sc. (Lab. Assistant)

Other Technical Services

Sri V. S. Panwar (Glass Blower)
Sri P. S. Saluja (Mechanic)
Sri A. K. Ghosh (Electrician)
Sri Mahipal Singh (Mechanic)
Sri Chandra Bali (Section Cutter)
Sri Chhotey Lal (Section Cutter)

Photography and Drawings

Sri P. C. Roy (Photographer)
Sri P. K. Bajpai (Artist)
Sri Pradeep Mohan (Dark Room Assistant)

Stores

Sri N. K. Khasnavis, B.Sc., LL.B. (Deputy Registrar)
Sri Harjeet Singh, B.A. (Store Keeper)
Smt. Omana Pillai (Stenotypist)

Accounts Section

Sri S. B. Verma, M.A., B.Com., D.P.A. (Accounts Officer)
Sri T. N. Shukla, B.A. (Accountant)
Sri B. K. Jain, B.A. (Junior Accountant)
Sri N. N. Joshi (U.D.C.)
Sri R. K. Takru, B.A. (U.D.C.)
Sri Dhoom Singh, B.A. (L.D.C.)
Sri Sanjay Kumar, B.A. (L.D.C.)

Administration

Sri Gurcharan Singh, M.A., LL.B. (Registrar)
Sri S. D. Mehtani (Deputy Registrar)
Sri S. K. Suri (Stenographer)
Sri S. P. Chadha, B.A. (P.A. to Director)
Sri H. S. Srivastava, B.Com. (Officer Assistant)
Sri Bhagwan Singh (Assistant)
Smt. P. K. Srivastava (Receptionist)
Sri R. B. Kukreti (Care Taker)
Sri I. J. S. Bedi (U.D.C.)
Sri Ramesh Chandra (U.D.C.)
Sri R. K. Kapoor, B.A. (L.D.C.)
Smt. V. Nirmala (L.D.C.)
Kumari Ruchita Bagchi, B.A. (L.D.C.)
Smt. Usha Chandra (Telephone Operator)
Smt. P. Thomas (L.D.C.)
Sri Joseph George (L.D.C.)
Sri Hari Lal (L.D.C.)
Sri Kosy Thomas (L.D.C.)

D. S. T. Sponsored Project—Ethnobiology

Dr D. C. Saini, M.Sc., Ph.D. (Research Associate)
Sri N. K. Sharma, M.Sc. (J.R.F.)

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

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

O. I. D. B. Projects (Two)
Kumari Geeta Saxena, M.Sc. (S.T.A.)
Sri E. G. Khare, B.Sc. (S.T.A.)
Kumari Madhuri Shukla (J.T.A.)
Sri Keshav Ram (J.T.A.)
Smt. Nijhum Pal, B.Sc. (J.T.A.)
Sri Krishnanand, B.Sc. (J.L.A.)
Smt. Madhulika Verma, M.Sc. (J.L.A.)

Appointments and Promotions

Emeritus Scientists

Dr R. N. Lakhanpal, Distinguished Scientist, was appointed as Emeritus Scientist w.e.f. 2nd November, 1984.

Dr Vishnu-Mittre, Deputy Director, was appointed as Emeritus Scientist w.e.f. 13th September, 1984.

Department of Non-Vascular Plants

Dr P. K. Misra, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Sri Rupendra Babu, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Department of Palaeophytic Evolutionary Botany

Smt. Rajni Tewari, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Department of Mesophytic Evolutionary Botany

Sri A. Rajnikanth, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Department of Cenophytic Evolutionary Botany

Dr Anil Agarwal, S.S.A., was promoted as Junior Scientific Officer w.e.f. 18th January, 1985.

Shri R. C. Mehrotra, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Department of Quaternary Biogeography and Archaeobotany

Dr H. P. Gupta, S.S.O., was promoted as Assistant Director w.e.f. 11th September, 1984.

Shri S. K. Bera, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Shri M. S. Chauhan, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Department of Pre-Gondwana and Gondwana Palynostratigraphy

Dr Suresh C. Srivastava, S.S.O., was promoted as Assistant Director w.e.f. 11th September, 1984.

Department of Post-Gondwana Palynostratigraphy of Peninsular India

Dr Anil Chandra, S.S.O., was promoted as Assistant Director w.e.f. 11th September, 1984.

Department of Post-Gondwana Palynostratigraphy of Extra-Peninsular India

Dr H. P. Singh, Assistant Director, was given a Special Grade w.e.f. 11th September, 1984.

Dr S. K. M. Tripathi, S.S.A., was promoted as Junior Scientific Officer w.e.f. 18th September, 1984.

Dr (Kumari) Asha Gupta, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Department of Planktonology

Dr Rahul Garg, S.S.A., was promoted as Junior Scientific Officer w.e.f. 18th September, 1984.

Sri Khowaja Ateequazamman, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Sri R. K. Saxena, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Smt. Jyotsna Rai, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Department of Biodiagenesis

Kumari Alpana Agarwal, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Sri B. D. Singh, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Department of Radiometric Dating

Sri A. P. Srivastava, J.S.A., was promoted as Senior Scientific Assistant w.e.f. 19th April, 1984.

Laboratory Services

Sri T. K. Mandal, J.T.A., was promoted as Senior Technical Assistant w.e.f. 15th December, 1984.

Smt. Sunita Khanna was appointed as Junior Technical Assistant w.e.f. 30th November, 1984.

Sri B. Sekar, S.T.A., was promoted as Junior Technical Officer w.e.f. 10th December, 1984.

Sri V. K. Singh, M.Sc., was appointed as Senior Technical Assistant w.e.f. 1st January, 1985.

Library

Sri J. N. Nigam, Librarian, was given the higher grade w.e.f. 15th December 1984.

Herbarium

Sri J. C. Srivastava, Herbarium Incharge, was given the higher grade w.e.f. 15th December, 1984.

Administration

Sri S. B. Verma, Accounts Officer, was appointed as Registrar w.e.f. 11th December, 1984.

Other Technical Services

Sri P. S. Saluja, Mechanic, was given the higher grade w.e.f. 29th November, 1984.

General Help

Shri K. C. Chandola, Peon, was promoted as Attendant w.e.f. 21st April, 1984.

Retirements

1. Dr Vishnu Mittre, Deputy Director, retired on 31st July, 1984.

2. Dr R. N. Lakhanpal, Distinguished Scientist, retired on 31st August, 1984.

3. Shri Gurcharan Singh, Registrar, retired on 30th November, 1984.

4. Dr M. N. Bose, Director, retired on 31st March, 1985.

Committees

Finance and Building Committee

Chairman

Professor A. K. Sharma, F.N.A.,
Botany Department,
Calcutta University, Calcutta 700 009

Members

Secretary,
Department of Science & Technology,
Technology Bhavan,
New Mehrauli Road, New Delhi 110 016

Joint Secretary (Finance),
Department of Science & Technology,
Technology Bhavan,
New Mehrauli Road, New Delhi 110 016

Superintending Engineer,
25th Circle, P.W.D., U.P.,
Lucknow

Shri S. C. Jain,
Divisional Engineer (Retd.), Northern Railway,
Indira Nagar, Lucknow

Professor B. S. Trivedi,
Botany Department, Lucknow University,
Lucknow 226 007

Dr M. N. Bose,
Birbal Sahni Institute of Palaeobotany,
Lucknow 226 007

Research Advisory Council

Professor Y.S.R.K. Sharma,
Centre of Advanced Study in Botany,
Banaras Hindu University, Varanasi 221 005

Dr Sunirmal Chanda,
Bose Institute, 93/1, Acharya Prafulla Chandra Road,
Calcutta 700 009

Professor S. B. Bhatia,
Geology Department,
Panjab University, Chandigarh

Professor B. S. Trivedi, F.N.A.,
Botany Department,
Lucknow University, Lucknow

Dr S. C. D. Sah, Director,
Wadia Institute of Himalayan Geology,
Dehradun

Dr S. K. Jain,
A-26, Mall Avenue Colony,
Lucknow

Professor K. S. Valdiya,
Head, Department of Geology,
Kumaon University, Nainital 263 002

Dr B. S. Venkatachala,
Institute of Petroleum Exploration,
Oil & Natural Gas Commission,
Dehradun

Deputy Director-General,
Geological Survey of India,
Northern Region,
Lucknow

Dr M. N. Bose,
Birbal Sahni Institute of Palaeobotany,
Lucknow

Dr Uttam Prakash,
Birbal Sahni Institute of Palaeobotany,
Lucknow

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, 1985 and also the relevant Income and Expenditure Account and Receipt 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, 1985 and the Income & Expenditure Account gives a true and fair view of income over expenditure.

For R. N. KHANNA & COMPANY
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, 1985

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 following Assets were created out of the recurring grants received during the year:

Books & Journals	Rs. 10,667.64
Books & Journals (Out of U.G.C. Grant)	Rs. 512.58
	Rs. 11,180.22

4. In the absence of classified details of completed building works, the sum of Rs. 28,00,664.90 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 1984-85

Birbal Sahni Institute

Balance Sheet as on

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.
Capital Fund :		
Balance as per last years Balance Sheet	1,34,15,396.12	
Add: Govt. of India Grants as Capital Accounts	21,00,000.00	
Recurring Expenditure used for creating fixed assets :		
Books & Journals	10,667.64	
Out of UGC Project	512.58	1,55,26,576.34
Advance Fund for Employees :		
As per last years Balance Sheet	4,47,465.00	
Advance during the year	2,04,245.00	
	6,51,710.00	
Less: Recovery during the year	67,487.00	5,84,223.00
Excess of Income over Expenditure	8,46,338.02	
Less: Transfer from Advance Fund	1,36,758.00	7,09,580.02

of Palaeobotany, Lucknow

31st March, 1985

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Fixed Assets:		
Land (Donated by Govt. of U. P.) ..		32,292.00
Works and 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	45,27,316.94
Research Apparatus and Equipments:		
As per Last year's Balance Sheet ..	36,96,634.96	
Additions during the year ..	3,21,557.57	40,18,192.53

LIABILITIES	AMOUNT Rs.	AMOUNT Rs
Donated Funds/Grants		
Cost of Land donated by U. P. Government	32,292.00	
Founder's donation	1,52,500.00	
C. D. Pant Memorial Fund	2,001.88	
C. L. Katiyal Memorial Fund	3,311.08	
P. C. Bhandari Memorial Fund	3,698.05	
A. C. Seward Memorial Fund	12,283.58	
Other Misc. Donations	12,646.29	
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	

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Workshop Equipment:		
As per last year's Balance Sheet ..		67,374.85
Office and Miscellaneous Equipments :		
As per last year's Balance Sheet ..	1,34,798.06	
Additions during the year ..	1,48,645.50	2,83,443.56
Establishment of C-14 Radio-metric Lab. :		
As per last year's Balance Sheet	25,60,215.02	
Additions during the year ..	95,647.69	26,55,862.71
Plant and Machinery :		
As per last year's Balance Sheet ..	6,44,615.12	
Additions during the year ..	1,84,265.82	8,28,880.94
Apparatus and Equipment (Donated) :		
M. G. T. Scheme (C.S.I.R.)..	7,155.79	
Burmah Oil Company ..	700.00	
Founder's Donation ..	2,500.00	
Coal Scheme (C.S.I.R.) ..	6,645.29	

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.
Gift in Kind		
Humboldt Foundation (West Germany)	75,000.00	
P. K. Srivastava Mem. Fund	3,380.00	
Birbal Sahni Research Award Endowment	21,400.00	
Prof. Thomas Maxwell Haris Endowment	7,000.00	3,91,145.10
		1,72,11,524.46
General Provident Fund/Contributory Provident Fund		21,88,891.77
Current Liabilities and Provisions:		
Security and Earnest Money Deposits		1,23,732.89
Total		1,95,24,149.12

ASSETS	AMOUNT Rs.	AMOUNT Rs.
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
		1,25,51,432.63
Vehicles :		
As per last year's Balance Sheet		2,88,685.07
Furniture and Fixtures :		
As per last year's Balance Sheet ..	9,97,531.23	
Additions during the year ..	1,89,642.55	11,87,173.78
Furniture and 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 and Journals :		
As per last year's Balance Sheet ..	4,19,758.10	

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.
Total B/F ..		1,95,24,149.12
Total		1,95,24,149.12

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Additions during the year ..	2,69,466.88	
Out of Revenue Account ..	1,379.94	6,90,604.92
Founder's Library (Donated)		50,000.00
Founder's Fossil Collection (Donated)		50,000.00
Maps and Toposheets :		
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 (Donated Accounts)	52,000.00	
Investment During the Year	10,000.00	62,000.00
Cash and Bank Balances :		
Cash in Hand ..	297.30	
Current Account with State Bank of India ..	9,94,324.88	9,94,622.18
Loans and Advances:		
Unsettled Advances—Plan Revenue Account ..	20,350.44	
Unsettled Advances—Plan Capital Account ..	7,71,799.28	

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.
Total B/F ..		1,95,24,149.12
Grand Total ..		1,95,24,149.12

(Sd.)	(Sd.)	(Sd.)
S. B. Verma	Gurcharan Singh	M. N. Bose
Accounts Officer	*Registrar*	*Director*
Birbal Sahni Institute of Palaeobotany	Birbal Sahni Institute of Palaeobotany	Birbal Sahni Institute of Palaeobotany

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Unsettled Advances Non-Plan Revenue Account ..	47,516.22	
Unsettled Advances D. S. T. Project ..	5,650.74	8,45,316.68
Advance to Employees :		
House Building Advance ..	5,08,333.00	
Festival Advance ..	9,100.00	
Conveyance Advance ..	66,790.00	5,84,223.00
General Provident Fund/Contributory Provident Fund :		
Investment ..	14,50,000.00	
Advance out of G. P. F. ..	2,21,345.00	
Insurance out of G. P. F. ..	12,881.00	
With State Bank of India ..	5,04,665.77	21,88,891.77
Grand Total ..		1,95,24,149.12

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 ..	5,98,834.63	15,93,395.22	21,92,229.85
To Field excursion ..	7,825.65	17,322.73	25,148.38
To Remmuneration of Birbal Sahni Professor ..	—	—	—
To Sponsoring & Participation in Conferences & Symposia, etc. ..	7,645.36	—	7,645.36
To Honorarium to Lecturers:			
For Birbal Sahni Mem. Lecture ..	—	500.00	500.00
For Silver Jubilee Mem. Lecture .	—	—	—
To International Programme:			
Deputation Abroad..	57,000.00	55,033.26	1,12,033.26
Honorarium for Visiting Scientist ..	6,000.00	—	6,000.00

of Palaeobotany, Lucknow

for the Year ending 31st March, 1985

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Balance of last year's Grant of Revenue Account allowed for expenditure during Current year	2,29,382.99	3,44,156.03	5,73,539.02
By Grants from Govt. of India ..	15,70,617.00	43,14,000.00	58,84,617.00
By Grant from U.P. Govt. on Revenue Account ..	—	—	—
By Sale Proceeds of Priced Publications:			
"The Palaeobotanist" ...	—	90,243.30	90,243.30
Monograph ..	—	1,550.00	1,550.00
Symposia & Spl. Publication ..	—	180.00	180.00
Seward Memorial Lecture ..	—	115.00	115.00
Birbal Sahni Memorial Lecture ..	—	46.00	46.00
Silver Jubilee Lecture	—	57.00	57.00
Picture Post Cards ..	—	570.75	570.75

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Expenses of Services Ancillary to Research:			
To Pay & Allowances of Aux. Tech. Staff ..	1,10,355.34	5,38,170.78	6,48,526.12
To Chemicals & Glasswares, Photo-goods & small Appa-ratus, etc. ..	1,09,117.26	1,65,253.88	2,74,371.14
To Library Require-ments ..	—	26,968.48	26,968.48
To Museum Require-ments ..	1,570.00	5,878.20	7,448.20
To Maintenance of Apparatus and Equip-ment & Workshop Machinery ..	34,881.85	—	34,881.85
To Publication Ex-penses:			
"The Palaeobotanist"	—	1,34,677.58	1,34,677.58
Birbal Sahni Memo-rial Lecture ..	—	—	—
Annual Report ..	—	12,000.00	12,000.00
Seward Memorial Lecture ..	—	—	—
Silver Jubilee Lecture	—	—	—

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Catalogue of Indian Fossil Plants ..	—	150.00	150.00
Aspects & Appraisal of Indian Palaeobotany ..	—	200.00	200.00
By Miscellaneous Receipts and Recoveries:			
Vehicle Chares ..	—	—	—
By Telephone Charges ..	—	1,052.36	1,052.36
By V. S. Room Charges ..	—	715.00	715.00
By Application Fees	—	1,992.95	1,992.95
Miscellacous Receipts and Recoveries ..	67.60	26,186.85	26,254.45
Interest on Conveyance Advance ..	—	4,792.15	4,792.15
Pension Contribution ..	—	—	—
Interest on House Building Advance ..	—	—	—
Employees Insurance Scheme ..	—	—	—

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Travelling & other Allowances:			
For Governing Body, Scientific Programme & Evaluation Committee and Selection Committee Meetings	—	24,812.17	24,812.17
For attending Scientific Meetings & Conferences in India and for Other purposes ..	15,958.95	50,136.85	66,095.80
For Reimbursement of Medical Expesnes	6,666.24	20,340.10	27,006.34
For Over Time Allowance ..	691.55	4,105.15	4,796.70
For Leave Travel Concession ..	11,220.00	16,081.91	27,301.91
For Reimbursement of Tution Fees ..	—	414.00	414.00
For Children Education Allowance ..	—	—	—
Funds for Training of Staff in India ..	—	—	—
To Pensionary Expenses:			
To Superannuation Allowance & Pension ..	—	3,86,124.79	3,86,124.79

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Deposit Account	—	—	—
Interest on Savings Bank Account ..	—	35,599.58	35,599.58
O.N.G.C. Project:			
Opening Balance ..	—	2,646.96	2,646.96
Grant ..	—	18,462.62	18,462.62
Misc./Receipts/ Refunds ..	—	2,750.36	2,750.36
Oil Industry Development Board:			
Opening Balance ..	—	19,566.15	19,566.15
Grant ..	—	75,000.00	75,000.00
U.G.C. Project:			
Opening Balance ..	—	2,000.00	2,000.00
Grant ..	—	6,000.00	6,000.00
All India Coordinated Research Project on Ethnobiology:			
Opening Balance ..	—	6,990.64	6,990.64
Grant ..	—	31,000.00	31,000.00
D.S.T. Project: "Palaeobiology, Sedimentology,..... Stratigraphy"			
Grant ..	—	1,63,200.00	1,63,200.00

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Payment under Insurance Scheme ..	—	—	—
G. P. F. Interest ..	—	85,069.58	55,069.58
G. P. F. Contribution ..	—	2,589.00	2,589.00
To General Expenses:			
To Pay & Allowances of Administrative Staff ..	1,75,718.78	7,13,547.02	8,89,265.80
To Telephone & Trunk Call Charges..	—	30,979.00	30,979.00
To Postage Charges	—	36,277.12	36,277.12
To Advertisement Charges ..	14,308.80	30,927.60	45,236.40
To Hot & Cold weather charges ..	17,250.00	9,900.00	27,150.00
To Petrol & Mobil Oil charges ...	1,877.90	9,469.26	11,347.16
To Electricity charges ..	31,720.81	2,73,166.28	3,04,887.09
To Municipal Taxes..	—	—	—
To Insurance of Vehicle & Library ..	—	6,848.00	6,848.00
To Uniform to Class IV Staff ..	4,630.59	15,000.00	19,630.59

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
U.G.C. Project-II:			
Grant ..	—	7,500.00	7,500.00
D.S.T. Project-II "Comparative Morphotaxonomic..... Modern Algae of Kachchh" ..	—	12,000.00	12,000.00
Grand Total	18,00,067.59	51,68,723·70	69,68,791.29

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs
To Printing & Stationery ..	44,485.64	39,942.95	84,428.59
To Custom Duty & Port Trust Charges ..	—	—	—
To Railway Ft. & Carriage ..	—	2,054.55	2,054.55
To Entertainment Allowance to Director ..	—	3,494.13	3,494.13
To Miscellaneous & Unforseen ..	34,747.16	55,150.38	89,897.54
To Maintenance Expenses:			
To Building ..	—	7,188.96	7,188.96
To Garden ..	—	4,821.85	4,821.85
To Vehicle ..	9,251.82	5,451.45	14,703.27
To Repairs & Renewals ..	9,094.37	11,863.12	20,957.49
To Other Expenses:			
To Deposits refunded ..	—	—	—
To Medical Advice ..	—	—	—
To Audit Fees ..	—	2,000.00	2,000.00
To Legal Advice ..	—	21,917.20	21,917.20

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total	18,00,067.59	51,68,723.70	69,68,791.29
Total	18,00,067.59	51,68,723.70	69,68,791.29

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Welfare Expenses:			
Financial Assistance to Departmental Centeen ..	—	4,857.00	4,857.00
Birbal Sahni Research Scholarship ..	—	55,055.01	55,055.01
Birbal Sahni Research Contingency ..	—	10,325.40	10,325.40
Emeritus Scientist- ..	—	15,656.37	15,656.37
O.N.G.C. Project:			
To Pay & Allowances ..	—	16,226.65	16,226.65
Chemical & Glasswares ..	—	3,692.26	3,692.26
Miscellaneous ..	—	218.13	218.13
Oil Industry Development Board:			
To Pay & Allowances ..	—	98,515.45	98,515.45
Chemicals & Glasswares ..	—	3,312.51	3,312.51
Travelling Allowance	—	2,833.00	2,833.00
Miscellaneous ..	—	1,598.55	1,598.55
Photography/Typing	—	4,390.00	4,390.00

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total	18,00,067.59	51,68,723.70	69,68,791.29
Total	18,00,067.59	51,68,723.70	69,68,791.29

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
U.G.C. Project:			
Honorarium to Mr D. N. Pant ..	—	11,000.00	11,000.00
Contingency ..	—	1,749.42	1,749.42
All India Coordinated Research project on Ethnobiology:			
Research Fellowship	—	15,500.00	15,500.00
To Pay & Allowances	—	13,328.14	13,328.14
Travelling Allowances ..	—	2,757.80	2,757.80
D.S.T. Project: "Palaeobiology, Sedimentology..... Stratigraphy"			
To Pay & Allowances ..	—	12,670.97	12,670.97
To Contractual Services ..	—	96.43	96.43
To Permanent Equipment ..	—	98,105.10	98,105.10
To Supplies & Materials ..	—	8,916.76	8,916.76
To Travelling Allowances ..	—	2,926.27	2,926.27

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total ..	18,00,067.59	51,68,723.70	69,68,791.29
Total ..	18,00,067.59	51,68,723.70	69,68,791.29

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Over Head Charges ..	—	1,496.80	1,496.80
U.G.C. Project-II			
To Living Allowance ..	—	5,967.74	5,967.74
To Contingency ..	—	1,500.00	1,500.00
Refunded to U.G.C.	—	32.26	32.26
D.S.T. Project-II "Comparative Morphotaxonomic..... Modern Algae of Kachchh"			
Excess of Income Over Expenditure ..	4,89,214.89	3,57,123.13	8,46,338.02
Grand Total ..	18,00,067.59	51,68,723.70	69,68,791.29

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	18,00,067.59	51,68,723.70	59,68,791.29
Total	18,00,067.59	51,68,723.70	59,68,791.29

(Sd. S. B. Verma)
Accounts Officer

Birbal Sahni Institute
of Palaeobotany

(Sd. M. N. Bose)
Director

Birbal Sahni Institute
of Palaeobotany

(Sd. Gurcharan Singh)
Registrar

Birbal Sahni Institute of Palaeobotany

Birbal Sahni Institute

"Receipt and Payment for the

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Opening Balance :			
Bank Account :			
Non-Plan Revenue Account ..	—	3,43,711.53	3,43,711.53
Plan Revenue Account	2,29,382.99	—	2,29,382.99
Plan Capital Account	4,00,397.11	—	4,00,397.11
Donation Account ..	—	6,370.88	6,370.88
Cash Account :			
Non-Plan Revenue Account	—	444.50	444.50
To Govt. of India Grants on Capital Account : ..	21,00,000.00	—	21,00,000.00
To Govt. of India Grants on Revenue Account :	15,70,617.00	43,14,000.00	58,84,617.00
To Govt. of U.P. Grant on Recurring Account:	—	—	—
To Sale Proceeds of Publication :			
The Palaeobotanist	—	90,243.30	90,243.30
Monograph ..	—	1,550.00	1,550.00
Symposium ..	—	180.00	180.00

of Palaeobotany, Lucknow

period 1.4.1984 to 31.3.1985"

PAYMENTS	PLAN Rs	NON-PLAN Rs.	TOTAL Rs.
Capital Account:			
By Works and Building:	8,35,301.51	—	8,35,301.51
By Research Apparatus & Equipment:	5,32,444.95	—	5,32,444.95
By Equipment for Services Ancillary to Research:			
Library ..	99,828.08	—	99,828.08
Photography ..	—	—	—
C-14 Laboratory ..	3,84,832.44	—	3,84,832.44
Plant & Machinery	76,475.44	—	76,475.44
By Furniture and Fixture:	2,37,554.90	—	2,37,554.90
By Pay & Allowances:			
Pay (Academic) ..	2,25,053.25	6,95,782.72	9,20,835.97
Pay (Technical) ..	34,103.06	1,91,142.33	2,25,245.39
Pay (Administrative)	60,235.52	2,60,875.41	3,21,110.93
D.A. & Addl. D.A.	4,32,049.30	13,29,539.20	17,61,588.50
House Rent Allowance ..	63,833.73	1,74,377.98	2,38,211.71

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Catalogue ..	—	150.00	150.00
Aspects and Appraisal of Indian Palaeobotany	—	200.00	200.00
Seward Memorial Lecture ..	—	115.00	115.00
Birbal Sahni Mem. Lecture	—	46.00	46.00
Picture Post Cards ..	—	570.75	570.75
Silver Jubilee Mem. Lecture ..	—	57.00	57.00
To Administrative Receipts :			
Income Tax ..	5,468.00	65,931.00	71,399.00
Insurance Premium (S. S. Sch.) ..	4,715.60	49,380.62	54,096.22
G. P. F. Subscription	72,580.64	3,35,173.00	4,07,750.64
Recovery of G. P. F. Advance ..	24,514.00	1,02,185.00	1,26,699.00
Recovery of B. S. I. P. Credit Cooperative Society ..	13,340.65	50,507.00	63,847.65
To Misc. Receipts and Recoveries :			
Application Fees ..	—	1,992.95	1,992.95
V. S. Room Rent ..	—	715.00	715.00

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
City Comp. Allowance ..	18,885.05	53,020.74	71,905.79
Interim Relief ..	33,503.34	99,667.93	1,33,171.27
Over Time Allowance ..	691.55	4,105.15	4,796.70
Medical Reimbursement ..	6,666.24	20,340.10	27,006.34
Reimbursement of Tuition Fees ..	—	414.00	414.00
Leave Travel Concession ..	11,220.00	16,081.91	27,301.91
Efficiency Bonus ..	550.00	1,529.81	2,079.81
Bonus ..	16,695.50	39,167.90	55.872.40
By Travelling Allowances:			
Governing Body & Selection Committee Meetings ..	—	24,812.17	24,812.17
For Attending Meeting & Conferences in India ..	—	3,589.00	3,589.00
Funds for Training of staff in India ..	—	—	—
For other purposes	16,383.95	48,014.85	64,398.80

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Telephone Charges ..	—	1,052.36	1,052.36
Vehicle Charges ..	—	—	—
Other Misc. Receipts	67.60	26,186.85	26,254.45
To Recoveries of Loans and Advances :			
Recovery of Festival Advance ..	—	18,060.00	18,060.00
Recovery of Conveyance Advance ..	—	13,098.00	13,098.00
Interest on Conveyance Advance ..	—	4,792.15	4,792.15
Recovery of House Building Advance ..	—	36,329.00	36,329.00
To Deposits :			
Security Deposits ..	1,35,911.97	—	1,35,911.97
To Donation and Endowments :			
Proceeds of Interest ..	—	4,500.00	4,500.00
Donation received during the year ..	—	7,000.00	7,000.00
To Misc. Receipts on Capital Account :			
Interest earned in Savings Bank Account	—	35,599.58	35,599.58
Misc. Receipt on Capital Account ..	—	—	—

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
By Maintenance of Property:			
For Building ..	—	7,991.96	7,991.96
For Garden ..	—	4,821.85	4,821.85
For Equipment & Apparatus ..	34,881.85	—	34,881.85
For Vehicle ..	9,251.82	5,551.45	14,803.27
For repairs, Renewals and Petty construction ..	9,094.37	13,223.12	22,317.49
By Contingencies:			
By Telephone and Trunk Call Charges	—	30,979.00	30,979.00
For Postage ..	—	36,277.12	36,277.12
For Advertisement	14,308.80	30,927.60	45,236.40
For Hot and Cold Weather Charges ..	17,250.00	9,900.00	27,150.00
For Petrol & Mobil Oil ..	2,166.30	9,687.71	11,854.01
For Electricity Charges ..	31,720.81	2,73,166.28	3,04,887.09
For Insurance of Vehicle & Library	—	6,848.00	6,848.00
For Liveries to Staff ..	4,630.59	15,000.00	19,630.59

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Investment (Bank Guarantee) ..		—	—
O. N. G. C. Project :			
Opening Balance ..	—	2,646.96	2,646.96
Grant ..	—	18,462.62	18,462.62
Misc. Receipts/Refunds	—	2,750.36	2,750.36
Oil Industry Development Board Project:			
Opening Balance ..	—	19,566.15	19,566.15
Grant ..	—	75,000.00	75,000.00
U. G. C. Project:			
Encyclopaedic Dictionary of Palaeobotany ..			
Opening Balance ..	—	2,000.00	2,000.00
Grant ..	—	6,000.00	6,000.00
All India Coordinated Research Project Ethnobiology:			
Opening Balance ..	—	6,990.64	6.990.64
Grant ..	—	31,000.00	31,000.00
D. S. T. Project :			
Palaeobiology, Sedimentology and Stratigraphy			

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
For Printing and Stationery ..	44,485.64	39,942.95	84,428.59
For Railway Ft. & Carriage ..	—	2,254.55	2,254.55
For Entertainment Allowance to Director ..	—	3,494.13	3,494.13
For Misc. & Unforeseen ..	34,747.16	57,208.38	91,955.54
For Chemicals and Glasswares ..	1,09,117.26	1,65,853.88	2,74,971.14
For Library Requirements ..	—	27,101.38	27,101.38
For Museum Requirements ..	1,570.00	5,878.20	7,448.20
For Legal Advice	—	21,917.20	21,917.20
For Medical Advice	—	—	—
For Audit Fees ..	—	2,000.00	2,000.00
For Publications:			
The Palaeobotanist	—	1,34,677.58	1,34,677.58
For Annual Report	—	12,000.00	12,000.00
For Birbal Sahni Mem. Lecture ..	—	—	—

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Grant ..	—	1,63,200.00	1,63,200.00
U. G. C. Project—II			
Grant ..	—	7,500.00	7,500.00
D. S. T. Project—II			
Comparative Morpho-taxonomic....Modern Algae of Kachchh			
Grant ..	—	12,000.00	12,000.00
Total ..	45,56,995.56	58,57,258.20	1,04,14,253.76

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
By Academic Expenses:			
For Field Excursion	27,462.69	47,965.90	75,428.59
Birbal Sahni Mem. Lecture ..	—	500.00	500.00
For Sir A.C. Seward Mem. Lecture out of Donation A/c.	—	4,150.00	4,150.00
Symposium & Seminar Co-Sponsored & Participation ..	7,645.36	—	7,645.36
By International Programmes:			
Air passage for members of staff proceeding on Foreign Fellowship or invited to attend Scientific Meeting and Conferences abroad (Deputation Abroad)	57,000.00	55,679.26	1,12,679.26
Honorarium for Visiting Scientist ..	6,000.00	—	6,000.00
By Welfare Expenses:			
Financial Assistance to Departmental Canteen ..	—	4,857.00	4,857.00

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F ..	45,56,995.56	58,57,258.20	1,04,14,253.76
Total ..	45,56,995.56	58,57,258.20	1,04,14,253.76

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
G. P. F. Account:			
G.P.F. Subscription Transferred to G.P.F. A/c. ..	72,580.64	3,35,173.00	4,07,753.64
Recovery of Advance transferred to G.P.F. A/c. ..	24,514.00	1,02,185.00	1,26,699.00
G.P.F. Interest ..	—	85,069.58	85,069.58
Institute Contribution to C.P.F. ..	—	2,589.00	2,589.00
By Miscellaneous:			
Income Tax Remitted ..	5,468.00	65,931.00	71,899.00
Insurance Premium Remitted (S. S. Scheme) ..	4,715.60	49,380.62	54,096.22
B.S.I.P. Cooperative Credit Society ..	13,340.65	50,507.00	63,847.65
B. S. Research Scholarship ..	—	55,055.01	55,055.01
B. S. Research Scholar Contingency	—	10,325.40	10,325.40
By Loans and Advances:			
Festival Advance ..	—	14,400.00	14,400.00

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F ..	45,56,995.56	58,57,258.20	1,04,14,253.76
Total ..	45,56,995.56	58,57,258.20	1,04,14,253.76

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Conveyance Advance ..	—	30,000.00	30,000.00
House Building Advance ..	—	1,59,845.00	1,59,845.00
Security Money refunded to Contractor ..	1,24,321.08	—	1,24,321.08
By Investments:			
Funds under Donation & Endowment Invested ..	—	10,000.00	10,000.00
By Pension & Superannuation:			
Pension, Family Pension & Gratuity etc. ..	—	3,86,124.79	3,86,124.79
Emeritus Scientist	—	15,656.37	15,656.37
O.N.G.C. Project:			
Pay of Staff ..	—	5,345.00	5,345.00
D.A. & Addl. D.A.	—	8,246.40	8,246.40
House Rent Allowance ..	—	1,138.23	1,138.23
City Comp. Allowance ..	—	341.52	341.52
Interim Relief ..	—	720.00	720.00
Bonus ..	—	435.50	435.50

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F ..	45,56,995.56	58,57,258.20	1,04,14,253.76
Total ..	45,56,995.56	58,57,258.20	1,04,14,253.76

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Chemicals & Glass-ware ..	—	3,692.26	3,692.26
Misc. & Unforeseen	—	218.13	218.13
Oil Industry Development Board Project:			
Pay of Staff ..	—	33,242.05	33,242.05
D.A. & Addl. D.A.	—	50,042.44	50,042.44
House Rent Allowance ..	—	7,459.16	7,459.16
City Comp. Allowance ..	—	2,237.79	2,237.79
Interim Relief ..	—	4,561.41	4,561.41
Bonus ..	—	972.60	972.60
Chemicals & Glass-wares ..	—	3,312.51	3,312.51
T.A. ..	—	2,833.00	2,833.00
Miscellaneous ..	—	1,598.55	1,598.55
Photography/Typing	—	4,390.00	4,390.00
U. G. C. Project: "Encyclopaedic Dictionary of..... Palaeobotany"			
Hororarium to Mr D. N. Pant ..	—	11,000.00	11,000.00

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F ..	45,56,995.56	58,57,258.20	1,04,14,253.76
Total ..	45,56,995.56	58,57,258.20	1,04,14,253.76

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Contingency ..	—	1,749.42	1,749.42
All India Coordinated Research Project on Ethnobiology:			
Research Associate/ Fellow ..	—	15,500.00	15,500.00
Pay of Staff ..	—	4,900.00	4,900.00
D.A. & Addl. D.A.	—	6,576.50	6,576.50
House Rent Allowance ..	—	1,047.41	1,047.41
City Comp. Allowance ..	—	314.23	314.23
Interim Relief ..	—	490.00	490.00
Travelling Allowance ..	—	2,757.80	2,757.80
D.S.T. Project: "Palaeobiology, Sedimentology.....and Stratigraphy"			
Salary of Staff ..	—	12,670.97	12,670.97
Contractual Services	—	96.43	96.43
Permanent Equipment ..	—	98,105.10	98,105.10
Supplies & Material	—	8,916.76	8,916.76
Travelling Allowance ..	—	8,577.01	8,577.01
Over Head Charges	—	1,496.80	1,496.80

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total C/o	45,56,995.56	58,57,258.20	1,04,14,253.76
Grand Total ..	45,56,995.56	58,57,258.20	1,04,14,253.67

BALANCE

	Bank	Cash	Total	
Plan:				
Central Recurring				
In Cash Book	4,68,864.45	—	4,68,864.45	
In C.D. Account	3,41,550.98	—	3,41,550.98	
In S.B. Account	4,000.00	—	4,000.00	8,14,415.43
Central Non-Recurring				
Non Plan:				
Central Recurring	1,41,556.02	297.30	1,41,854.12	
Donation and Endowment	3,720.88	—	3,720.88	1,45,575.00
Projects:				
O.N.G.C.	3,722.90	—	3,722.90	
Ethnobiology	6,404.70	—	6,404.70	
D.S.T. (Palaeobiology..... Stratigraphy)	33,336.93	—	33,336.93	
D.S.T. (Comparative...Kachchh)	12,000.00	—	12,000.00	
			55,464.53	
Excess U.G.C.	4,749.42			
O.I.D.B.	16,083.36	(—)	20,832.78	34,631.75
				9,94,622.18

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
U.G.C. Project—II			
Living Allowance..	—	5,967.74	5,967.74
Refunded to Bank	—	32.26	32.26
Contingency ..	—	1,500.00	1,500.00
D.S.T. Project—II			
"Comparative Morphotaxonomic..... Modern Algae of Kachchh"	—	—	—
Grand Total ..	37,42,580.13	56,77,051.45	94,19,631.58

(Sd.)	(Sd.)	(Sd.)
(S. B. Verma)	(Gurcharan Singh)	(M. N. Bose)
Accounts Officer	*Registrar*	*Director*
Birbal Sahni Institute of Palaeobotany	Birbal Sahni Institute of Palaeobotany	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