ANNUAL REPORT
1983-84

BIRBAL SAHNI
INSTITUTE OF PALAEOBOTANY
LUCKNOW

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CONTENTS

Introduction

The Institute is engaged in research on the various aspects of plant fossils and dissemination of advanced palaeobotanical knowledge in accordance with the ideas of its Founder, Professor Birbal Sahni. The scientific activities at the Institute are carried out under various projects distributed amongst the following 11 departments:

1. Department of Non-Vascular Plants
2. Department of Mesophytic Evolutionary Botany
3. Department of Palaeophytic Evolutionary Botany
4. Department of Cenophytic Evolutionary Botany
5. Department of Quaternary Biogeography and Archaeobotany
6. Department of Pre-Gondwana and Gondwana Palynostratigraphy
7. Department of Post-Gondwana Palynostratigraphy of Peninsular India
8. Department of Post-Gondwana Palynostratigraphy of Extra-Peninsular India
9. Department of Planktonology
10. Department of Biodiagenesis
11. Department of Radiometric Dating

Besides, the research work is carried out under various collaborative projects with several other Indian as well as foreign institutions like Geological Survey of India; Oil and Natural Gas

Commission; Wadia Institute of Himalayan Geology; Musee 'Royal de l' Afrique Centrale, Belgium; Skidway Institute of Oceanography, Georgia, U. S. A., etc. Further technical assistance and training in palaeobotanical research are also given to scientists from various other institutions.

Some of the main and important scientific achievements made during the year are as follows :

A new genus of acritarch, *Vindhyasphaeridium* and a new cyanophycean genus *Chopania* have been reported from the Semri and Kaimur groups. The study of the genus *Chuaria* recovered from the Suket Shale Formation indicates that the allied forms *Krishanania*, etc. are morphologically identical to *Chuaria*, because the variations in their shapes are due to differential preservation during fossilization. Two algal genera, *Ethelia* and *Thaumatoporella* have been recorded for the first time from the Post-Gondwana. An Australian male fertile genus has been found in the Handappa flora, which is the first record from India. A new megaspore genus *Noniasporites* has been reported from the Upper Permian of Raniganj Coalfield. A gymnospermous seed, *Maheshwariella spinicornuta* has been recorded from the Karharbari Formation. The study of megaflora from the Tiki Formation suggests that the age of this formation ranges from early to late Upper Triassic. A new type of bisexual bennettitalean flower—*Amarjolea dactylota* from Amarjola has been reported. Three new genera have been reported from the Kachchh Basin. A fossil alga, *Lithophyllum* of the family Coralliaraceae, reported from the Deccan Intertraps in Madhya Pradesh further supports the evidence of marine conditions near Mohgaon Kalan in Central India during Early Tertiary. An Araucarian wood has been reported from the Neogene of West Bengal for the first time from India. About 130 species of pollen grains have been identified from the Silent Valley. The pollen analysis of samples from Upper Bhawani, Nilgiris has revealed the dominance of Poaceae, *Senecio* and *Peperomia* over the scant presence of arboreal pollen even though the surrounding area is forested

by the Shola Forest. Rice remains have been recorded from Mahagara, Barauha, Manigara, Sohgura and from two late Harappan sites. Besides, the carbonised grains of *Triticum dicoccum* and *Trigonella foenum-graecum* have been reported for the first time from India. At Raniganj-Panchet level a well defined miofloral change has been established which indicates a Permo-Triassic transition. The palynological study of the Malla Johar assemblage indicates a Gondwanic affinity for the Tethyan mioflora rather than the northern one. A new cingulate trilete miospore has been reported from the Triassic sediments of Rajmahal Hills. On the basis of relative dominance of palynomorphs, three new cenozones have been established in the Khari Nadi Formation (Miocene). Three new significant taxa have been reported from the Karaikal Well-9. The study of the type sections exposed around Tarakeshwar town in Surat area indicates a short lived marine transgression along Tapti lineament during late Eocene. During the year, radiocarbon measurements of 73 samples have been carried out. Besides, 43 samples from the Quaternary deposits and 18 samples from various archaeological excavations have been dated. A sample of buried wood piece from Meghalaya on dating suggests an event of landslide associated with earthquake between 560 BC. and 860 BC.

Governing Body

Chairman

Professor A. K. Sharma, F.N.A.,
Botany Department,
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Shrimati Savitri Sahni,
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Department of Science & Technology,
Technology Bhavan, New Mehrauli Road,
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Director-General,
Archaeological Survey of India,
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Lucknow 226 007

Assistant Secretary (**Non-Member**)
Shri Gurcharan Singh,

Registrar,
Birbal Sahni Institute of Palaeobotany,
Lucknow 226 007

Honours and Awards

Garud K. B. Navale	..	Elected Fellow of The Palaeobotanical Society,
Hari P. Singh	..	Elected Fellow of The Palaeobotanical Society.
Hari K. Maheshwari	..	Elected Fellow of The Palaeobotanical Society.
Krishna P. Jain	..	Elected Fellow of the Indian Association of Palynostratigraphers.
Mahendra N. Bose	..	Invited to chair the Symposium on "Mesozoic Plant Biology" by the Organising Committee of the Palaeobotanical Conference held in Montpellier from 11th to 15th July, 1983.
	..	Invited to chair the session of Palaeobotany and Palynology of 9th African Micropaleontological Colloquium, Abidjan. Côte-D' Ivoire.
Prabhat K. Maithy	..	Elected Fellow of The Palaeobotanical Society.
Ram S. Tiwari	..	Elected Fellow of The Palaeobotanical Society.
	..	Elected Fellow of the Indian Association of Palynostratigraphers.

.. Elected Fellow of the Palaeontological Society of India.

.. Elected Fellow of the International Association of Applied Biology.

Sukh Dev .. Elected Fellow of The Palaeobotanical Society.

Anant P. Bhattacharyya .. Awarded the degree of Doctor of Philosophy for his work "Palynological investigation of Lower Gondwana sedimentary deposits in Bankura District, West Bengal" by the Burdwan University.

Bijai Prasad .. Awarded the degre of Doctor of Philosophy for his work "Contribution to the stratigraphy and palaeobotany of the Lower Gondwana succession in Rajmahal Hills, Bihar" by the Banaras Hindu University.

Basant K. Misra .. Awarded the degree of Doctor of Philosophy for his work "Palynopetrostratigraphy of the Tertiary coals from Makum Coalfield, Upper Assam" by the Lucknow University.

Malagalapalli R. Rao .. Awarded the degree of Doctor of Philosophy for his work "Palynostratigraphy of Tertiary sediments of Sonapur-Badarpur Road Section, Lower Assam" by the Lucknow University.

Pradip K. Misra .. Awarded Fellowship of the Indian Botanical Society.

.. Awarded the degree of Doctor of Philosophy for his work "Studies on the fresh water Chlorophyceae of the Andaman and Nicobar Islands" by the Lucknow University.

Pankaj K. Pal .. Awarded the degree of Doctor of Philosophy for his work 'Contributions to the Triassic flora of Madhya Pradesh and the Jurassic flora of Rajmahal Hills, Bihar" by the Lucknow University.

.. Awarded the Dr Chunnilal Katiyal Prize of the Birbal Sahni Institute of Palaeobotany.

Rakesh Saxena .. Awarded the degree of Doctor of Philosophy for his work "Palynostratigraphical and petrological studies of coals from West Bokaro Coalfield, Bihar, India" by the Lucknow University.

Ram R. Yadav .. Awarded the degree of Doctor of Philosophy for his work "studies on petrified woods from Siwalik beds and palynology of oceanic sediments from the western coast of India" by the Lucknow University.

Samir Sarkar	..	Awarded the degree of Doctor of Philosophy for his work "Contribution to the palynology of Tertiary sediments of Himachal Pradesh, India" by the Lucknow Uaiversity.
Surya K. M. Tripathi	..	Awarded the degree of Doctor of Philosophy for his work "Contribution to the Tertiary palynostratigraphy of Assam" by the Lucknow University.

Representation in Committees/Boards

Anand Prakash	..	Treasurer, Indian Association of Palynostratigraphers.
Anil Chandra	..	Member, Executive Council, The Palaeobotanical Society.
Archana Tripathi	..	Member, Executive Committee, The Palaeobotanical Society.
Garud K. B. Navale	..	Member, International Committee for Coal Petrology.
	..	Member, International Sub-committee for Gondwana Coal, I.C.P.P.
	..	Member, International Commission on Coal and Lignite Nomenclature and Analysis.
	..	Member, International Commissions on A.C.P.G. & A.C.P.I.
	..	Member, Indian National Working Group on Global Correlation of Coal.

	..	Member, Editorial Board, "Coal Geology".
	..	Joint Secretary, Organising Committee of Indian Coal Petrology.
Hafiz A. Khan	..	Secretary, Indian Palynological Society.
Hari K. Maheshwari	..	Member, Committee for Fossil Plants, International Association for Plant Taxonomy.
	..	Editor, The Palaeobotanist (up to November, 1983).
	..	Editor, Indian Association of Palynostratigraphers.
Hari P. Gupta	..	Business Manager, Indian Association of Palynostratigraphers.
Hari P. Singh	..	Secretary, The Palaeobotanical Society.
	..	Organising Secretary, 5th Indian Geophytological Conference.
	..	Organising Secretary, 2nd All India Conference of Aerobiology.
	..	Editor, "The Palaeobotanist"
	..	Editor, "The Palaeobotanist"
	..	Member, Editorial Board, "Geophytology".
	..	Councillor, International Commission for Palynology.

	..	Regional Representative of India, International Organization of Palaeobotany.
Jagannath P. Mandal	..	Joint Editor, 'Vanaspatik Club Newsletter'.
Krishna P. Jain	..	Member, Association des palynologues de langue Francaise, France.
	..	Secretary, Indian Association of Palynostratigraphers.
Mahendra N. Bose	..	Vice-President, The Palaeobotanical Society.
	..	Member, Research Advisory Committee, Wadia Institute of Himalayan Geology.
	..	Chairman, Editorial Board, "The Palaeobotanist".
	..	Member, Editorial Board, "Palaeontographica".
	..	Member, International Scientific Committee of 9th African Micropalaeontological Colloquium.
Nilambar Awasthi	..	Editor, "Geophytology".
Prabhat K. Maithy	..	Member, Editorial Board, "Geoviews".
	..	Joint Secretary, Organising Committee, Fifth Indian Geophytological Conference.
Rajendra N. Lakhanpal	..	Chief Editor, "The Palaeobotanist".

	..	Member, Sectional Committees for Botany, Indian National Science Academy.
	..	Member, Executive Committee, International Association for Angiosperm Palaeobotany.
Ram S. Tiwari	..	Chief Editor, "Geophytology".
	..	Editor, "The Palaeobotanist" (till Nov., 1983).
	..	Chief Editor, "Vanaspatik Club Newsletter", Lucknow.
	..	Member, Executive Committee, Palaeontological Society of India.
	..	Vice-President, Indian Association of Palynostratigraphers.
Ranjit K. Kar	..	Joint Secretary, The Palaeobotanical Society.
	..	Joint Secretary, Organising Committee, V Indian Geophytological Conference.
	..	Founder Member, Indian National Earth Sciences Academy.
Sayed A. Jafar	..	Editor "The Palaeobotanist".
Suresh C. Srivastava	..	Editor, "The Palaeobotanist".
	..	Editor, "Geophytology".
Uttam Prakash	..	Regional Representative for India, International Association for Angiosperm Palaeobotany.

.. Member, Sigma XI, Harvard Chapter, U.S.A.

Vishnu-Mittre .. Member, Central Expert Committee (Planning Commission) on Lok Tak Lake, Imphal.

.. Member, Central Advisory Board of Archaeology.

.. Member, Committee of Research Studies, Burdwan University.

.. Member, Executive Council, Indian Aerobiological Society.

.. Consultant, Department of Environment and Ecology, U. P. State.

Research

Department of Non-Vascular Plants

Project : *Palaeobiology of Vindhyan Supergroup and its equivalent formations*

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

The observations on the evidence of life and its exogenic activities from the Semri and Kaimur groups exposed around Chopan have been completed. Two papers, one on "Chitinozoa-like remains" and the other "on a new body fossil *Misraea*" have been completed. A new genus of acritarch, *Vindhyasphaeridium* and a new cyanophycean genus *Chopania* have also been recognised. Detailed morphological study of stromatolites including their microbiota present in between laminations was also completed.

P. K. Maithy and Rupendra Babu

Remains of algae like *Eosynechoccus, Myxococcoides, Palaeoanacystis, Gloeocapsomorpha, Palaeolyngbya, Ameliaphycus* and *Oscillatoriopsis* were recorded from the Nagod Limestone Formation of Bhander.

P. K. Maithy and Bijai Prasad

Chitinozoa-like remains comparable to *Desmochitina* and *Conochitina*, Cyanophyceae—*Palaeoanacystis, Myxococcoides, Gloeocapsamorpha, Gunflintia* and *Oscillatoriopsis* and Cryptarch—*Protosphaeridium, Orygmatosphaeridium, Kildinella, Granomarginata* and *Baltisphaeridium* have been reported from the Semri Group of Chitrakoot, Banda District.

P. K. Maithy and Kalyan L. Meena

The observations on *Chuaria* from the Suket Shale Formation, Rampura have been completed. The study indicates that the allied forms *Krishnania*, etc. are morphologically identical to *Chuaria*, as the variations in their shapes are due to differential preservation during fossilization. Besides, a new jelly fish, *Rampuraea* and two unrecorded body fossils *Allotheca* and *Coleolella* were also recognised.

P. K. Maithy and Manoj Shukla

The external morphology, microstructure and microbiota in the stromatolites recovered from the Deoban and Mandhali formations of Pithoragarh have been completed. The recovered stromatolites, viz., *Stratifera, Gongylina, Colonella, Baicalia, Minzaria, Gryptozoon, Masloviella* and *Kussiella* have heen identified.

Manoj Shukla

The acritarch from the phosporite beds belonging to the Lower Tal Formation and Dhurmala mine was recorded. The characteristic forms are: *Protosphaeridium, Kildinella, Granomarginata, Leiominuscula, Margiominuscula, Favosphaeridium, Symplassosphaeridium, Leiovalia, Navifusa* and *Leioligotriletum*. This assemblage is comparable to the Vendian assemblage.

Bijai Prasad and P. K. Maithy

A paper on the evidences of different biological forms of life from the Precambrian of India was completed. Besides, another paper dealing with the records of biological life from different Precambrian horizons of India was completed. This paper records especially the aspects of the identification of biological remains and their importance in stratigraphy.

P. K. Maithy

Project : Non-vascular plants from Post-Gondwana rocks

Objective : To study morphology of the non-vascular plants, their trends of evolution and stratigrphical significance

Thirty one taxa belonging to 17 genera of Cyanophyceae, Chlorophyceae and Rhodophyceae have been identified from Varagur, Trichinapalli District. A new genus *Palaeomastigocladus* and a new species of the genus *Amphiroa* have been recognised. Besides, the genera *Ethelia* and *Thaumatoporella* were recorded for the first time.

P. K. Misra and Pramod Kumar

The fertile specimens of *Archaeolithothamnium* and *Mesophyllum* from the algal limestone beds exposed in Senduari and Matur districts have been recorded. In addition to it, the other common forms were *Parachaetes* and *Cayeuxia*.

P. K. Misra

Twenty four genera of fungal remains were recorded from the Miocene of Kerala Coast. Out of these, four genera, viz., *Elsikisporonites*, *Hylinaesporonites*, *Bharadwajiasporonites* and *Quiloniasporonites* are new.

Pramod Kumar

Department of Palaeophytic Evolutionary Botany

Project : *Resolution of gymnosperms and pteridophytes in Glossopteris Flora*

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

Morphographical investigations of *Glossopteris* leaves collected from the Upper Permian exposures near Handappa, Dhenkanal District, Orissa were continued. In all, 87 specimens belonging to 25 species of *Glossopteris* have been studied. Out of these, the study of 17 species have been completed. They are *G. taeniensis, G. gopadensis, G. oldhamii, G.* cf. *damudica, G. mohudaensis, G. barakarensis, G. stenoneura, G pandurata, G. angusta, G.* cf. *divergense, G. radiata, G. duocaudata, G. lanceolatus, G. stricta, G. nimishea, G. angustifolia* and *G. tenuifolia.* Their description, photographs, text-figures and comparison have been completed. Apart from these, the text-figures of 60 *Glossopteris* leaves have also been made. Studies of other genera like *Phyllotheca, Schizoneura, Raniganjia, Trizygia, Neomariopteris, Dichotomopteris, Santhalea* and *Pseudoctenis* were also started from the same locality.

Kamaljeet Singh and Shaila Chandra

Study of fertile genera belonging to *Glossopteris* flora from Handappa in Dhenkanal District of Orissa was continued. Several specimens of the fertile organs were sorted out, photographed and observations made. New species of the genera *Glossotheca, Eretmonia, Partha* and *Lidgettonia* have also been undertaken for study. A new genus of fructification has also been found, which is being studied. An Australian male fertile genus has also been found in the Handappa flora which is the first record of the genus from India.

Revision of lycopods, pteridophytes and gymnosperms from Handappa has been taken up.

Shaila Chandra

The study of two species of the genus *Lelstotheca*, *L. striata* sp. nov. and *L. robusta*, from the Barakar Formation of Raniganj Coalfield has been completed. The new species is characterised by the presence of interconnecting longitudinal striations over the surface of leaves. A paper on this study is being written.

Observations, description and photography of leaves showing dissected margin and reticulate venation recovered from the Sengramgarh Colliery have been completed. The leaves are distinct from all the known Lower Gondwana leaf genera, hence, a new name *Gondwanophyllites* has been proposed for such forms. A paper on the above study is being finalized.

A. K. Srivastava

Study of plant megafossils belonging to Lalmatia Coalmine, Rajmahal Hills, Bihar was continued. The fossil assemblage is dominated by *Glossopteris* leaves, viz., *G. communis*, *G. indica*, etc. Axes of *Vertebraria indica* also occur with these leaves. Sterile forms of *Neomariopteris* sp , equisetalean axes, *Sphenophyllum* sp. and *Lelstotheca* sp. have also been identified. Impressions of glossopterid sporangia of *Arbertella* sp., scale leaves and seeds have been found scattered in association with the *Glossopteris* leaves. These plant fossils are usually impressions without a satisfactorily preserved cuticular crust and therefore, their epidermal study by preparing cuticles is not possible. Most of the specimens have been figured and photographed.

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

Study of fossil flora of the Raniganj Formation, Raniganj Coalfield was continued. Plant megafossils from Mahabir Colliery and a seam exposed near Kumarpur have been sorted out and photographed and line tracings of few types have been made.

Cuticular preparations have been obtained from one species each of *Rhabdotaenia*, *Belemnopteris* and *Palaeovittaria* and 2-3 species of *Glossopteris*. Preliminary description of species of the genus *Belemnopteris* has been written.

A paper on the "*Noniasporites*", a new megaspore genus from the Upper Permian of Raniganj Coalfield has been submitted for publication. The paper deals with a new type of megaspore recovered from a shale of Kumarpur Sandstone Member of the Raniganj Formation which is characterised by the presence of a large number of rill-like folds which mark the rays of the trilete mark. Another characteristic feature is the apparent absence of a mesospore.

H. K. Maheshwari and Usha Bajpai

A paper "On two new species of fossil woods from Raniganj Formation, India: with remarks on *Zalesskioxylon zambesiensis* from Mozambique" has been submitted for publication. The paper deals with the two species of fossil wood, viz., *Araucarioxylon bradshawianum* and *Damudoxylon lepekhinae* which have been described. The taxonomic position and circumscription of the two genera have been discussed. *Zalesskioxylon zambesiensis* has been reinvestigated and found to be conspecific with *Australoxylon teixeirae*.

Usha Bajpai and H. K. Maheshwari

A paper on "*Araucarioxylon kumarpurensis*, a new species of gymnospermous wood from the Upper Permian of West Bengal" has been completed and submitted for publication. The new species was identified after a microscopical study of ground thin sections and cellulose acetate paper peels prepared from a number of petrified wood pieces collected from Coal Seam IX, Raniganj Formation, West Raniganj Coalfield. The woods are mostly limonitic and usually very much crushed; however, at places they show good preservation. The secondary xylem shows distinct annual rings, mostly uniseriate xylem rays and 1-2 seriate araucarioid pits on the radial walls of tracheids and 2-8 cupressoid

pits in the cross-fields. The new species closely compares with *Dadoxylon bengalense* Holden which, however, is easily distinguished by mixed type of radial pitting.

Usha Bajpai and V. K. Singh

A thesis entitled, "Studies in morphology of woody plants, Lower Gondwana woods" has been submitted for the Degree of Doctor of Philosophy in Allahabad University.

V. K. Singh

Description of megaspores from the Karharbari Formation of Johilla, Hutar, Mohpani and Giridih coalfields has been completed. About 60 text-figures of various types of megaspores have been sketched and printed. Following types of genera and species of the megaspores have been identified: *Bokarosporites rotundus, Talchirella trivedii, T. nitens, T. flavata, Duosporites congoensis, Duosporites* sp. nov., *Banksisporites utkalensis, B. indicus, B.* sp., *Jhariatriletes filiformis, Barakarella pantii,* two new species of *Barakarella* and *Biharisporites spinosus.*

Rajni Tewari and H. K. Maheshwari

A paper on "*Maheshwariella spinicornuta,* a new species of gymnospermous seed from the Karharbari Formation" has been submitted for publication. The new species is instituted for an orthotropous platyspermic bilaterally symmetrical seed, bearing two long tubular expansions at the micropylar end.

H. K. Maheshwari and Rajni Tewari

A paper entitled "Electron microscope investigation of the megaspore of *Isoetes coromandelina* L." has been submitted for publication. In *Isoetes coromandelina* L., a megasporangium contains between 728 to 1546 megaspores. Size-wise the megaspores in each megasporangium may be grouped into 3 categories. The megaspore sporoderm is tuberculate, the distal sporoderm has numerous tubercles, while the proximal

surface has only one or at maximum three tubercles in each inter-ray area. The Scanning Electron micrograph of the fractured sporoderm surface shows presence of three layers, the outermost perine forming the tubercles. The surface of tubercle is micro-pitted while the bases of the adjacent tubercles are connected by thread-like extensions. Ultra-thin sections show ramifying rod-like sporopollenin units.

Usha Bajpai and H. K. Maheshwari

Megaspores of six species of the genus *Selaginella* have been investigated and photographed under S. E. M. both from proximal and distal sides. Broken megaspores of each species have also been photographed. It has been possible to observe discrete sporopollenin units in the perisporium.

Usha Bajpai

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*

A paper on a new cone recovered from the Triassic of Nidpur was finalized. The cone bears linear arrangement of sporangia on its lower surface having bisaccate pollen grains. Another paper dealing with a new synangial form having cingulate spores is being written. Besides, some seeds compressed on rock surface have been photographed.

Shyam C. Srivastava

Cuticular preparations and microphotography of seeds isolated from the bulk maceration of samples from Nidpur were continued. Three distinct seed genera as well as a new species of the genus *Rugaspermum* have been identified. The description of these seeds is being written. More preparations of some other plant remains, e.g. fertile organs, algal, ? fungal, and bryophytic remains have also been made.

Shyam C. Srivastava and S. R. Manik

Neocalamites sp., *Marattiopsis* sp., *Dicroidium hughesii* and *Desmiophyllum* sp. have been recorded from the Dhaurai Hill beds. Megafloristically as well as lithologically these beds appear to belong to the Parsora Formation.

P. K. Pal

In a brief note on the Upper Triassic megaflora the genera *Lepidopteris, Dicroidium* and *Elatocladus* from Giar, Shahdol District have been described.

Shyam C. Srivastava and P. K. Pal

The megaflora from the Tiki Formation has been described which is dominated by *Lepidopteris* and *Dicroidium*. However, in the younger part of the formation coniferous elements like *Elatocladus* and *Pugiophyllum* are also quite abundant. The pteridophytes are very rare, being represented by a few equisetaceous remains. The entire flora from this formation contains 16 species belonging to 9 genera. From this study it appears that the age of the Tiki Formation ranges from Early to Late Upper Triassic.

A puper on the megaflora from the Hartala Hill beds has been finalized. In this paper *Brachyphyllum* sp., *Pagiophyllum* sp. and *Desmiophyllum* sp. have been described. A Rhaeto-Liassic age has been suggested for these beds.

P. K. Pal

The work on the revision of the Triassic megaflora from the Peninsular India was continued.

Jayasri Banerji and P. K. Pal

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*

A paper on "*Amarjolia dactylota*—a new type of bisexual bennettitalean flower from Amarjola" was finalized and submitted for publication.

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 Jobalpur Formation from botanical and stratigraphical view point*

Preliminary descriptions of some species belonging to *Cladophlebis, Ptilophyllum, Taeniopteris, Brachyphyllum, Araucarites* and *Satpuria* from the Jabalpur Formation have been written. A number of specimens have been photographed.

Sukh Dev and Neeru Pandya

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

Objective : *To carry out morphological and cuticular studies*

Preparation of cuticular slides of pteridosperms and conifers was continued. These plants belong to *Cycadopteris, Brachyphyllum, Pagiophyllum, Allocladus,* etc. Some photographic plates of fossil pteridophytes and cycadophytes have been prepared for the monographic study. The descriptions of megafossils were being written.

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 monograph entitled "Fossil flora of Kachchh-Mesozoic megafossils" was completed and submitted for publication. The flora includes 82 species belonging to 44 genera (including 3 new genera). A number of taxa have been recorded for the first time from Kachchh, i.e. *Thallites, Hepaticites, Hausmannia, Dictyophyllum,*

Coniopteris, Caytonia, Linguifolium, Ctenozamites, Pseudoctenis, Anomozamites, Nilssoniopteris, Dictyozamites, Bennetticarpus, Allocladus. Middle-Upper Jurassic age has been suggested for this flora.

M. N. Bose and Jayasri Banerji

Detailed study of megaspores from various localities of Bhuj Formation has been completed. The assemblage comprises 27 species belonging to 11 genera, indicating Lower Cretaceous age.

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

Preliminary descriptions alongwith photographic plates and a few text-figures of the species belonging to *Cladophlebis, Phlebopteris, Pachypteris, Otozamites, Brachyphyllum, Pagiophyllum* and *Coniferocaulon*, etc. from Sarnu, Rajasthan have been completed.

Jayasri Banerji and P. K. Pal

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*

In all, 65 Mesozoic wood specimens were cut and the prepared slides were examined. The specimens belong to Podocarpaceae, Araucariaceae, Taxaceae and Cupressaceae. Preliminary descriptions along with some photographs and text-figures of six species have been completed. A paper on 'A taxacean wood from the Jurassic of Maharashtra' was also finalized. Preliminary descriptions of various species of *Pachypteris, Ptilophyllum, Dictyozamites, Brachyphyllum, Pagiophyllum* and *Araucarites* were written. Besides, photographs and text-figures of these taxa have been partly prepared.

Sukh Dev and A. Rajnikanth

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

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

Some plant megafossils from Athgarh Basin have been photographed. These belong to *Phlebopteris*, *Cladophlebis*, *Sphenopteris*, *Ptilophyllum*, *Brachyphyllum*, *Coniferocaulon*, etc. Their descriptions were being written.

Sukh Dev and Neeru Pandya

Preliminary descriptions of some pteridophytes and cycadophytes from the Cauvery Basin have been written. Their photographs and text-figures have been partly prepared.

Sukh Dev and A. 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 to study the plant fossils in detail to unravel the Early Tertiary vegetation and climate*

The algal genus *Lithophyllum* of the family Corallinaceae was photographed and described in detail from the Mohgaon cherts in Chhindwara District of Madhya Pradesh. This provides further evidence of marine conditions near Mohgaon Kalan in Central India during the Early Tertiary.

Uttam Prakash and M. B. Bande

A paper dealing with the fossil woods of *Phyllanthus* from the Deccan Intertrappean beds of Nawargaon and the Tipam sandstones of Assam was finalized and another paper on the 'Genus *Phyllanthus* from the Tertiary of India with critical remarks on the nomenclature of fossil woods of Euphorbiaceae' were finalized and submitted for publication.

Uttam Prakash, M. B. Bande and V. Lalitha

A paper on fossil woods of Verbenaceae (*Gmelina* Linn.) and Apocynaceae from the Deccan Intertrappean beds of Nawargaon with comments on the nomenclature of Tertiary fossil woods is being finalized. Besides, 10 more fossil woods from this locality were cut and slides prepared.

M. B. Bande

A fossil wood collected from Ghughua near Shahpura in Mandla District of Madhya Pradesh was studied, photographed and identified with *Canarium-Bursera-Garuga* of the family Burseraceae. The manuscript on this study has partly been written. Besides, a paper on two petrified woods 'Fossil woods of *Lophopetalum* and *Artocarpus* from the Deccan Intertrappean beds of Mandla District, Madhya Pradesh' was finalized and submitted for publication.

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

Twenty fossil dicotyledonous woods from near Shahpura in Mandla District were further cut, systematically studied and photographed. Some of them belong to new forms showing near resemblance with the modern taxa *Holigarna* of Anacardiaceae, *Hydnocarpus* of Flacourtiaceae, *Tristania* and *Eucalyptus* of Myrtaceae, *Walsura* of Meliaceae and *Sonneratia* of Sonneratiaceae. Besides, a fruiting axis resembling the extant taxa *Melaleguca* and *Callistemon* of Myrtaceae was also photographed and described from near Shahpura.

R. C. Mehrotra

Three fossil palm woods collected from Mandla District were sectioned, studied and photographed and a manuscript prepared. These bear leaf scars on the external surface and show a near resemblance with the stem wood of the extant genus *Corypha*.

Uttam Prakash, R. C. Mehrotra and Krishna Ambwani

A manuscript on *Palmoxylon dilacunosum* sp. nov. from the Deccan Intertrappean beds of Mandla District was finalized and another manuscript on *Palmostroboxylon arengoides* sp. nov. from the same beds was completed and submitted for publication.

Five more fossil monocot woods collected from Mandla District were cut and their identification is in progress. To compare fossil palm woods and to know the anatomical variations among the modern woods of the species of *Areca, Arenga, Borassus, Cocos, Caryota, Hyphaene, Licuala, Livistona,* and *Washingtonia,* their thin sections were examined. Besides, in order to know the anatomical variability within different regions of palm stems the observations on the anatomy of about 6 fit tall palm stem of *Trachycarpus martiana* were finalized and a paper was also completed.

Krishna Ambwani

A petrified palm wood collected from the Deccan traps of Banswara District, Rajasthan was studied, photographed and a manuscript prepared.

Uttam Prakash and Krishna Ambwani

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

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

The study of the Tertiary plant megafossils of Kachchh has been completed. The manuscript on this monographic study has also been submitted for publication.

R. N. Lakhanpal, J. S. Guleria and Nilambar Awasthi

About 50 fossil woods from the various Pliocene localities in Kachchh District were cut and studied. They were found belonging to the genera *Dipterocarpus, Cynometra, Terminalia, Afzelia-Intsia, Millettia-Pongamia* and *Sterculia.* About 25 woods collected from near Jaisalmer were also sectioned and on the basis of preliminary examination some of these have been found new to the area.

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*

A paper on the occurrence of *Xanthophyllum* in the Cuddalore sandstones near Pondicherry is being written.

A paper on some carbonised woods from the Neyveli Lignite, India, was finalized. The paper deals with five dicotyledonous woods resembling those of *Hopea*, *Gluta*, *Carallia*, *Diospyros* and *Cordia*. In the light of the present distribution of the above species with which the carbonised woods resemble, the palaeoclimate around Neyveli has also been discussed briefly.

Nilambar Awasthi

About 75 pieces of carbonised woods from the Neyveli Lignite were sectioned and studied. Some of the woods were also studied under refraction microscope for which cross, tangential and radial surfaces of the wood blocks were polished using Alumina polish. The woods were identified with certain genera belonging to the family Sapindaceae, Anacardiaceae, Rosaceae, Lecythidaceae, Rubiaceae, etc. In addition, preliminary observations on leaf-impressions and compressions collected from lignite mine were made and photographed.

A paper on a carbonised wood resembling *Parinarium* from the Neyveli lignite deposits, India was completed and submitted for publication. A draft manuscript of another paper dealing with a fossil wood of Rubiaceae was also prepared.

Nilambar Awasthi and Anil Agarwal

A paper on some more carbonised woods from the Neogene of Kerala Coast, India was finalized and submitted for publication.

Besides, more carbonised woods collected from various Neogene localities, viz., Varkala, Padappakara, Meenkunnu, Payangadi and Cheruvathur in Kerala Coast were sectioned and observations made. Some of them were identified with the modern taxa : *Anisoptera*, *Dryobalanops*, *Euphoria*, *Barringtonia* and those of the families Anacardiaceae and Leguminosae.

Nilambar Awasthi and Madhu Panjwani

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

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

Three fossil woods collected from the Lower Siwalik beds of Kalagarh were studied, photographed and identified with the modern taxa *Diospyros* of *Ebenaceae* and *Terminalia* and *Anogeissus* of Combretaceae and a manuscript was prepared. Besides, a paper on the wood of *Bauhinia* from the Lower Siwalik beds of Uttar Pradesh, India was finalized and submitted for publication.

Uttam Prakash and Mahesh Prasad

A large number of fossil woods from the Lower Siwalik beds of Kalagarh were again cut, studied and photographed. Two of them were found new which show near resemblance with *Ormosia* of Leguminosae and *Tristania* of Myrtaceae.

About 11 leaf-impressions resembling the modern leaves of *Terminalia angustifolia*, *Millettia ovalifolia*, *Cassia hirsuta*, *Ficus globerrina*, *Eretusa*, *Datura fastuosa*, *Diospyros montana*, *Mesua ferrea*, *Calycopteris floribunda*, *Randia wallichii* and *Tabernaemontana coronaria* from the Lower Siwalik beds of Koilabas, Nepal were studied, described, photographed and a manuscript was prepared. Further, about 15 new types of leaf-impressions recently collected from the same locality were also studied and photographed.

Mahesh Prasad

Three leaf-impressions resembling those of *Dillenia indica*, *Anogeissus sericea* and *Syzygium claviflorum* of Dilleniaceae, Combretaceae and Myrtaceae respectively were studied, photographed and described in detail and a paper on the leaf impressions from the Lower Siwalik beds of Koilabas, Nepal was completed and submitted for publication.

Uttam Prakash and Mahesh Prasad

Identification and description of seven fossil woods from the Lower Siwalik beds of Nalagarh and Kalagarh were finalized with the modern taxa *Anisoptera* and *Dipterocarpus* of Dipterocarpaceae, *Aglaia* of Meliaceae and *Acrocarpus*, *Ormosia*, *Koompassia* and *Adenanthera* of Leguminosae. A paper on this study was also finalized.

Uttam Prakash and Ram Ratan

Draft manuscript of a paper describing 12 dicotyledonous leaf-impressions comparable to the modern leaves of *Urena lobata*, *Aphanomixis polystachya*, *Toona ciliata*, *Cassia glauca*, *Derris scandens*, *Pterocarpus macrocarpus*, *Ardesia* sp., (*A. humilis*, *A. neriifolius*, *A. solanaceae*), *Syzygium bracteatum*, *Ipomoea eriocarpa*, *Adhatoda vasica* and *Persea lanceolata* from the Siwalik beds of Bhikhnathoree, Bihar has been prepared.

Besides, a collection of leaf-impression collected from the Lower Siwalik beds near Tanakpur was examined. The leaves were cleared and selected for morphotaxonomic study. They represent about 40 types belonging to several families of dicotyledons.

R. N. Lakhanpal and Nilambar Awasthi

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

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

A number of fossil woods from the Neogene localities of West Bengal were further cut and thin sections were studied. A few new forms belonging to the family Anacardiaceae and Legu-

minosae were recognized. Besides, a paper on the occurrence of Araucarian wood from the Neogene of West Bengal, India was finalized and submitted for publication. This forms the first record of Araucariaceae in the Neogene of India.

A collection of fossil woods and leaf-impressions from the Neogene of Palamau District, Bihar was also examined. The fossil wood resembling *Hardwickia* and the leaf-impressions comparable to *Mangifera*, *Melia* and *Shorea* have been tentatively identified.

Uttam Prakash and G. P. Srivastava

A large number of petrified woods collected from the Tipam sandstones of Assam and Negaland were studied and described. Some of the woods were tentatively identified with the modern woods of *Terminalia* of Combretaceae, *Gluta* of Anacardiaceae, *Canarium* of Burseraceae, *Milletia*, *Cassia* and *Bauhinia* of Leguminosae, *Lophopetalum* of Celastraceae, *Dipterocarpus-Anisoptera* of Dipterocarpaceae and *Elaeocarpus-Echinocarpurs* of Elaeocarpaceae.

Uttam Prakash and Nai-Zheng Du

A paper on the fossil woods resembling *Kingiodendron* and *Bauhinia* from the Namsang beds of Deomali, Arunachal Pradesh was finalized and submitted for publication. A draft manuscript of another paper describing two fossil woods resembling *Bischofia* of Euphorbiaceae and *Antiaris* of Moraceae from the same locality was also prepared.

Nilambar Awasthi and Uttam Prakash

Observations on the leaf-impressions from the Palaeocene of Cherrapunji (Meghalaya) and Oligocene of Leedo (Assam) were completed and a manuscript is being finalized. They were tentatively kept under Leguminosae (*Bauhinia, Butea*), Sapotaceae (*Cassia*), Combretaceae (*Terminalia*), Moraceae (*Ficus*), Myrtaceae, Rhizophoraceae, Convolvulaceae and Guttiferae. Some fruits belonging to legumes from the Oligocene of Baragolai were tentatively identified.

Krishna Ambwani

Project : *Studies on plant megafossils from the Karewa beds of Kashmir*

Objective : *To investigate leaf-impressions and other plant megafossils from the Karewas for floristic and climatic oscillations in Kashmir Valley during the Plio-Pleistocene*

A few more carbonised woods from the Karewa beds of Kashmir were cut and studied. They have been identified as *Cupressus* and *Juglans*.

Nilambar Awasthi and J. S. Guleria

General

A paper dealing with the Tertiary vegetation, palaeoclimate, phytogeography of South-East Asia was taken up and the manuscript is being finalized.

Uttam Prakash and M. B. Bande

A paper 'Bibliography of Indian Palaeobotany for 1981-1982' was finalized and submitted for publication.

J. S. Guleria

Tertiary from Abroad

Studies on the fossil woods from Burma

The petrified woods recovered from the Neogene of Burma were studied and a number of them were photographed and tentatively indentified with *Terminalia, Koompassia, Lagerstroemia, Millettia, Afzelia-Intsia* and *Araucaria-Agathis*.

Uttam Prakash and Nai-Zheng Du

Studies on the fossil woods from China

A number of fossil woods were tentatively identified with Araucariaceae, Taxodiaceae and Taxaceae among the gymnosperms and *Robinia, Gleditshia* and *Elaeocarpus-Echinocarpus* among the angiosperms. They were photographed and described briefly.

Nai-Zheng Du

Department of Quaternary Biogeography and Archaeobotany

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

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

A paper on the discovery of *Eleusine africana* Kennedy O' Bryne (*E. coracana* subsp. *africana* Philips) in India and its biogeographical implications was prepared.

Vishnu-Mittre and Aruna Sharma

The morphological study of the modern seeds and fruits of several species of *Cyperus, Carex, Scirpus* and *Trianthema* was done to identify the carbonised seeds and fruits recovered from Surkotada, Kachchh.

Chanchala

Description of pollen grains of 130 species of the Silent Valley was completed. Some have been photographed also. A draft manuscript of 'An atlas of pollen grains of the Silent Valley' is being written.

Vishnu-Mittre and 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*

A draft manuscript on the history of vegetation and climate in the tropics was prepared. In this paper the work done so far in the tropics all over the world including South India has been reviewed.

Overviewing the various criteria for the delimitation of Neogene/Quaternary boundary both in terrestrial and marine sediments a draft manuscript "When did the Quaternary Period began—An overview of fresh information" was prepared to reveal strange anomaly in the date for the beginning of the Quaternary. In the event of the date 1.6 m yrs from isotope stratigraphy, nannofossil, and foraminiferal investigations of oceanic sediments and 2.5 m years from palynological investigations of the measured terrestrial sections and some dates in between and beyond 2.5 m years, the problem remains unsettled. The change over of faunal and floral populations from Pliocene to Pleistocene accompanied by evidence of cooling is suggested in the paper as a dependable criterion rather than on single individuals or change in climate alone.

Vishnu-Mittre

A draft manuscript on 'An appraisal of Quaternary history of South Asia through radio-metric ages' was written utilising the available radiometric age data for the major synchronous events in floristic alteration, cultural and geomorphological events in South Asia. Quite a few of these events interestingly compare with similar major changes on global scale.

Vishnu-Mittre and G. Rajagopalan

A paper on vegetation and climate during the last glaciation in Ladakh, western Himalaya was finalised bringing out as many as eight interstadials from the pollen analysis of two deep profiles from Tsokar lake about 5,000 m above sea level. More or less same number of interstadials have been recognised from northern and southern Europe and interestingly some trans-himalayan interstadials have been found synchronous with those in Europe. It is hoped that the others presently beyond the C14 range may also synchronise with those in Europe if dated by thermal diffusion isotopic enrichment of C14 as demonstrated recently in Europe by G. M. Woillard and Wilhem G. Mook.

Vishnu-Mittre and Amalava Bhattacharya

Maceration and counting of pollen/spores in 41 bore-core samples from 1.90 m deep profile from Bastua, District Sidhi, Madhya Pradesh and construction of pollen diagram have been completed. Pollen diagrams from Amgaon and from a section along Chhui Stream also constructed. The pollen spectra of modern surface samples from Amgaon, Bastua, Tingi, Jhandaya Hill, Pondi and Chunipat were also prepared.

Collectively the three pollen diagrams from Bastua, Amgaon and Chhui Stream portray history of vegetation from 12,000 yrs B. P. to recent yrs B. P. Until 8,7000 yrs B. P. grasslands with sedges predominated with spores of pteridophytes. Deciduous plant taxa such as *Emblica officinalis*, *Adina cordifolia*, spp. of *Lagerstroemia*, *Terminalia*, *Mitragyna*, *Anogeissus*, etc. immigrated between 6,700-5,000 yrs B.P. *Madhuca indica*, *Lannea grandis*, *Diospyros*, etc. immigrated later. Thus the tree savannah eventually turned into a deciduous forest to which Sal (*Shorea robusta*), spp. of *Acacia*, *Flacourtia* and *Buchnania* immigrated by about 1,200 yrs B. P. The ferns declined substantially. A paper on the above results has been completed.

Vishnu-Mittre & M. S. Chauhan

The first draft of Ph.D. Thesis 'The origin and history of tropical deciduous forests in M. P.' has partly been written.

M. S. Chauhan

A surface sample from Upper Bhawani, Nilgiris on pollen analysis has revealed dominance of Poaceae, *Senecio* and *Peperomia* over the scantily present arboreal pollen even though the surrounding area is forested by the Shola Forest. The pollen analysis of two samples from the profile from Upper Bhawani has revealed more or less similar pollen spectra. These observations are important in interpreting the past vegetation from fossil pollen spectra.

H. P. Gupta

The pollen diagram and pollen spectra from Colgrain, Nilgiris were finalised. Two photographic plates of pollen grains from Colgrain were also prepared. The manuscript on "Vegetational development during the 30,000 yrs B. P. at Colgrain, Nilgiris, South India" is being finalized.

H. P. Gupta and Kamla Prasad

A pollen diagram from a marginal profile of Naukuchiya Tal was prepared and vegetational anomaly observed. A paper on 'Holocene palynology from Naukuchiya Tal, District Nainital, Kumaon Himalaya, U. P.' was also prepared. A few samples from a central profile from the same lake were also investigated to work out the variability in the deposition of pollen/spores in the lake basin.

H. P. Gupta and Asha Khandelwal

A paper on 'Recent pollen spectra from Garhwal Himalaya' based on the studies of 43 samples collected between 700-2,700 m from within several forest communities such as Sal forest, *Acacia-Dalbergia* forest, subtropical pine forest, pine-oak forest, spruce-fir-oak forest, etc. was finalized. The study reveals that the pollen spectra from the latter two communities represent them comparatively better than others from other communities.

A manuscript on 'Late Quaternary vegetational history in Himachal Pradesh-3, Parasram Tal' was finalized. The 5 m profile reveals vegetational development during the last 3,000 years B. P. The chir-pine-oak woods, with which the history begins, pollen diagram shows increase of *Abies*, *Picea*, *Cedrus* and temperate *Pinus wallichiana* about 1,000 years B. P. Decline in forest is indicated by 700 B. P. when *Peperomia*, Poaceae, Cheno-ams, Urticaceae, etc. increased suggesting forest clearances for agriculture.

Pollen analysis of four samples recovered from a profile from Rewalsar, District Mandi, Himachal Pradesh was also done. The results reveal overall dominance of arboreals.

Chhaya Sharma

Project : *Quaternary vegetational history of Central Himalaya, Kathmandu Valley, Nepal*

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

Only six samples out of 16 from Pokhra and two out of 12 from Tekkhola were pollen analysed. They have been found rich in pollen grains.

Vishnu-Mittre

Project : *History of the Silent Valley forests*

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

The pollen diagram for profile no. 1 was prepared. Its base is dated by radiocarbon to 1,000 years B. P. The diagram reveals the occurrence of a fresh water swamp at the site which underwent gradual drying up followed by grassland savannah with the immigration in the vicinity of *Cullenia-Palaquium* forest.

Vishnu-Mittre and H. A. Khan

Project : *History of ancient plant economy of India*

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

A manuscript on the "Ancient plant economy at Diamabad" incorporating the detailed studies of remains of leaves, seeds, fruits and charcoals was prepared.

Vishnu-Mittre, Aruna Sharma and Chanchala

To build up the diffusionary trends and morphographic changes in rice in time and space particularly in North India, the rice remains from Mahagara (Allahabad), Baraunha and Manigara (Mirzapur), Sohgura (Gorakhpur) and from the two late Harappan sites (Hulas in Saharanpur) were investigated.

Vishnu-Mittre and Aruna Sharma

The following species among the segregated carbonised grains from the Harappan site Surkotada in Kachchh were identified.

Cyperus iria, Trianthema pentandra, Scirpus maritimus, Trifolium repens, Phragmites karka and species of *Andropogon, Brachiaria, Panicum, Echinochloa, Eragrostis* and *Digitaria*. These have been photographed also.

A paper on 'The use in India of wild plant life in time and space and its biogeographical implications' was also prepared.

Vishnu-Mittre and Chanchala

The carbonised grains from the Harappan site Rohira, Sangrur District, Punjab were identified as of *Triticum sphaerococcum, T. dicoccum, Hordeum vulgare, H. vulgare* var. *nudum, Lens culinaris, Dolichos biflorus* and *Trigonella foenum-graecum.* A manuscript on the food economy of the Harappans at this site was prepared and submitted for publication. A short note on the discovery of *Triticum dicoccum* and *Trigonella foenum-graecum* for the first time from India was also sent for publication.

Among the carbonised grains from the Pre-Harappan levels of this site, most of which are of the same kinds as from the Harappan levels, grape pips and stones of date palm are the interesting discoveries.

Wheat, barley, lentil and grape pips have also been identified from the late Harappan site, Mahorana in Punjab.

A manuscript on the plant economy of ancient Sringaverapura (C.1,050-1,000 B.C.) was completed. Twelve charcoals collected from this site were sectioned and tentatively identified.

K. S. Saraswat

A paper on 'Early Holocene Barley in India' was prepared.

Aruna Sharma

A sample of charcoals from late Harappan levels at Diamabad and fragmentary small pieces of charcoals from the Buff and Cream Ware levels from the same site were processed, sectioned and prepared the permanent mounts. A charcoal from the Harappan levels was identified as of *Boswellia serrata* whereas the others could not be identified.

The first draft of Ph.D. Thesis on "Wild plant remains from the archaeological sites—A palaeobotanical, palaeoecological and palaeoethnobotanical study" has partly been completed.

Chanchala

Project : *Studies in aerobiology*

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

The atmospheric pollen catch for the year March, 1983—February, 1984 has been completed at the Birbal Sahni Institute of Palaeobotany. The meteorological data have also been recorded. Pollen grains of *Parthenium* and *Ligustrum* were recorded for the first time, but the pollen of *Santalum album* and *Gravillea robusta* were not recorded. Among fungi, *Aspergillus fumigatus* was found dominant.

A few trial exposures were conducted (in December, 1983 and January, 1984) in the upper air (5,000 m) with the help of Indian Air lines. Only a few grains of Cheno-ams and Poaceae were recovered. *Aspergillus fumigatus*, *A. niger* and *Monilia* sp. were found in good amount in colony counts of petridishes exposed in the air-craft.

The atmospheric pollen/spore catch for the year March 1983-February, 1984 was commenced. Pollen grains of *Emblica officinalis*, *Drypetis roxburghii*, *Pithecolobium dulce*, *Azadirachta indica*, etc. which normally flower after March were caught in the beginning of March, 1984. Possibly, the early rise in temperature induced early flowering of these plants.

Vishnu-Mittre and Asha Khandelwal

Photography of pollen grains and construction of modern pollen spectra and their graphic presentation along transacts were completed. The SEM studies of pollen of *Shorea robusta* were completed. The study has revealed that Sal tree as reported earlier is a very high pollen producer. Pollen production/population area is 315232, 78, 26, 90, 784×10^3/hectare. Sal pollen dispersed at ground level is 40-50%, in trunk space 35% but 9-14% above tree canopy. A small percentage, however, is preserved in moss cushions 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 forest. Its poor preservation in soil samples within the forest and outside against its high pollen production requires investigation. It may be due to pH of the soil or due to microbial activity. A manuscript on the "Studies of pollen production and sedimentation within Sal forests in Sidhi forest Division, M. P., has been prepared.

Vishnu-Mittre and S. K. Bera

The first draft of Ph.D. Thesis on "Studies in pollen production and sedimentation within the Sal forests in Sidhi Forest Division, M. P." was partly written.

S. K. Bera

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

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

Much useful information has been gathered from District Gazetteers published from 1883 to 1929 of several states in the country on the primitive methods of paddy cultivation in diverse environments such as river banks, around springs and lakes, in marshes subject to tidal flooding, etc. with or without ploughing, manuring and irrigation. The various methods include dibbling, broadcasting and in advanced stages pretreatment of seeds, transplanting and ploughing the same field several times. In drought prone areas particularly paddy has been a dryland crop, and millets have been cultivated through dibbling and broad casting without any attention being paid to the crop thereafter till it is ripe.

Vishnu-Mittre

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

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

A manuscript dealing with fossil woods of *Dipterocarpus*, and *Anisoptera* from Kalagarh, U. P. and *Aglaia*, *Acrocarpus*, *Ormosia*,

Koompassia and *Adenanthera* from Nalagarh, U. P. has been finalised. The paper reports two new fossil taxa, viz., *Aglainium* (Meliaceae) and *Acrocarpoxylon* (Leguminosae) and concludes that during the middle Miocene times tropical forests existed in the vicinities of Kalagarh and Nalagarh under a warm humid climate.

Uttam Prakash and Ram Ratan Yadav

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*

Subproject : *Palynostratigraphy of the Lower Gondwana sediments in Godavari Valley*

The investigation of the Lower Gondwana sediments of the bore-hole CKG-2 of Kothagudem area was done. The mioflora was characterised by the dominance of non-striate-disaccate pollen grains comparable to the known Lower Barakar miofloras.

A thin coal seam exposed in a scarp near Mulung was investigated and was found to have the dominance of structured trilete miospores and radial monosaccate pollen grains suggesting a Lower Karharbari aspect.

The Lower Gondwana sediments of the bore-hole GJ-3 and GJ-6 were reinvestigated and the results obtained confirm our previous data.

Identification of the sporae dispersae and palynostratigraphy of the Lower Gondwana sequence from Talchir to Middle Kamthi formations recovered from Ramagundum and Chelpur areas was finalized. The data have been incorporated in a Ph.D. Thesis.

Suresh C. Srivastava and Neerja Jha

Subproject : Palynostratigraphy of the Lower Gondwana sediments in Satpura Gondwana Basin, Madhya Pradesh

The palynostratigraphical studies of the Lower Gondwana sediments from the Shobhapur Block, Pathakhera coal mines, Betul-coalfields and sediments exposed south of Pachmarhi ridge were carried out.

Suresh C. Srivastava and O. S. Sarate

Subproject : Correlation of coal seams in Korba Coalfield, Madhya Pradesh

Bore-hole samples from Kusmunda Block of the Korba Coalfield were studied palynologically. The mioflora contained in the coal seams showed Lower Barakar to Upper Barakar aspects. Correlation of coal seams has been suggested.

Suresh C. Srivastava

Subproject : Palynostratigraphy of the Lower Gondwana sediments from Talchir Coalfield, Orissa

Sediments of the bore-hole NCTB 288 in Bharatpur Block of the Talchir Coalfield have been studied palynologically in which two miofloral zones have been demarcated. The lower seam is characterised by the dominance of *Scheuringipollenites* + *Brevitriletes* while the upper seam is marked by the dominance of *Faunipollenites* + *Cyclogranisporites*. Correlation of these assemblages has been suggested. The pebble bed present consistently in between the two coal seams has been considered as intraformational conglomerate.

Suresh C. Srivastava

Project : Palynostratigraphy of the Jurassic-Lower Cretaceous beds of Kachchh Basin

Objective : To establish palynostratigraphy in Kachchh Basin

Identification and quantitative estimation of miospore assemblages recovered from 27 samples of Chawad River Section

have heen carried out. In all samples the most dominating form is the genus *Araucariacites*. In three samples microplanktons were also recovered. The trilete genera are qualitatively and quantitatively poor. Identifications of miospore assemblages recovered from 10 samples collected from well-cuttings near Sekhpur and Walka Mota of Kachchh have been done. These samples are qualitatively and quantitatively rich in trilete genera. Hilate forms such as *Cooksonites* and *Aequitriradites* are also present. One sample from Walkamota has been found very rich in *Aequitriradites*.

H. K. Maheshwari and B. N. Jana

Besides, 50 megaspores recovered from Ugedi, Bhuki River and Kera-well have been macerated gradationally. The assemblage contains 27 species referable to 11 genera.

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

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

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

Subproject : *Palynostratigraphic studies of the Gondwana sediments in South Rewa Gondwana Basin*

Palynostratigraphic studies of Johilla Coalfield were continued. In all, 40 samples from Johilla River Section including one bore-core (U/K/D-8) were macerated, the yield being very poor. However, evidences for the age of Pali and Parsora formations are being gathered. The identification of sporae dispersae was continued.

R. S. Tiwari and Ram Awatar

Subproject : Palynostratigraphical studies of Permo-Triassic sediments in Damodar Valley

In continuation of the study in East Raniganj Coalfield, more samples of bore-holes RAD-5 and RAD-4 have been counted and a correlation could be established between them. At Raniganj/Panchet boundary level a well-defined miofloral change has been established which indicates a Permo-Triassic transition.

R. S. Tiwari and Vijaya Singh

Samples from bore-hole RDA-7 from the eastern part of the Raniganj Coalfield have yielded a rich mioflora. The morphotaxonomic study of the mioflora recovered from bore-hole RAD-8 from the same area was also continued.

R. S. Tiwari and Kindu L. Meena

Subproject : Palynological study of Central Himalaya

Study of Krol-Tal and related strata near Maldevta, Tal Valley and Garhwal has been undertaken. Beside this, the carboniferous strata in the Spiti Valley have yielded a good assemblage of miospores.

R. S. Tiwari

Subproject : Palynostratigraphic studies of the Gondwana sediments in Rajmahal Basin

The results of palynological analysis of the bore-hole RJR-2 have been completed. The findings indicate that the Upper Triassic and Upper Jurassic/Lower Cretaceous age for the assemblage found in sediments representing the Dubrajpur Formation and the first Intertrappean. Samples of bore-hole RJNE-9 have been counted for the palynological dating.

R. S. Tiwari, Pramod Kumar and Archana Tripathi

Subproject : Palynostratigraphic studies of the Lower Gondwana sediments of Arunachal Pradesh, Sikkim and Darjeeling Himalaya

Palynostratigraphic studies of the Lower Gondwana sediments from Siang District were continued. Further collection has been made from Siang, Subansiri and Kameng districts for the same purpose.

Suresh C. Srivastava

Subproject : Palynostratigraphic studies of the Upper Palaeozoic sediments of Tethyan sediments, U. P. Himalayas

The palynological data from Malla Johar area have been compiled and the results have been finalized. The palynological assemblages indicate a Gondwanic affinity for the Tethyan mioflora rather than the northern one.

R. S. Tiwari and Vijaya Singh

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 cingulate trilete miospore is described from the Triassic sediments of Rajmahal Hills and a paper has been submitted for publication.

R S. Tiwari, Archana Tripathi and Pramod Kumar

Study of some disaccate dispersed pollen has been concluded and morphographic delimitations have been suggested on the basis of fine exine characters.

R. S. Tiwari and Vijaya Singh

Morphotaxonomic circumscription of the sporae dispersae of Godavari Valley Coalfields has been completed.

Suresh C. Srivastava and Neerja Jha

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

Suresh C. Srivastava and O. S. Sarate

For the data handling and retrieval system a new computer program has been fabricated for the palynological data and other related sciences. This system has also been applied for the Indian sediments. The results have been compiled in the form of a paper which has been submitted for publication.

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

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 manuscript on 'Observations on some Tertiary zonisulcate pollen grains' has been finalized and sent for publication. Previously the pollen genus *Assamialetes* was described as non-aperturate. The present detailed morphological study reveals that the genus is zonisulcate with a weak union between the two saucer-like halves. Accordingly, the generic diagnosis of this genus has been emended.

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

A paper dealing with the study of 'Algal and fungal remains from Jowai-Sonapur Road Section (Palaeocene-Eocene), Meghalaya, India' was completed and submitted for publication. The paper includes systematic descriptions of 11 genera and 24 species of dinoflagellate cysts and 10 genera and 12 species of the fungal remains.

S. K. M. Tripathi

A paper on 'Palynostratigraphical zonation and correlation of Jowai-Badarpur Road Section, Meghalaya, India' particularly dealing with the Palaeocene-Eocene sediments was finalized and submitted for publication. Five palynozones have been established. In ascending order of stratigraphy they are : (*i*) *Lycopodiumsporites psilatus* Zone, (*ii*) *Palmidites obtusus* Zone, (*iii*) *Apectodinium homomorphum* Zone, (*iv*) *Turbiosphaera proximata* Zone, and (*v*) *Densiverrupollenites eocenicus* Zone. Lateral persistence of the first three palynozones pertaining to the Therria Formation has been observed in the Cherra, Tura and Mikir formations of Meghalaya and Assam.

A manuscript dealing with the palynological studies on the Jowai-Badarpur Road Section (Palaeocene-Eocene) Meghalaya India : Part I—descriptive palynology was also completed. It deals with the systematic descriptions of pteridophytic spores and angiospermous pollen grains. This paper has been submitted for publication.

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

A manuscript on 'Palynological studies on the Jowai-Badarpur Road Section (Palaeocene-Eocene), Meghalaya, India : Part II dealing with the qualitative analysis and data interpretation' was finalized. The Therria palynofloral assemblage in comparable to that described from the Palaeocene of Kachchh. The present palynological data indicate that the sediments investigated were deposited under shallow marine conditions and the climate was warm and humid.

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

Fungal remains from the Barail (Oligocene) and Surma Lower Miocene) sediments of Sonapur-Badarpur Road Section, in Jaintia Hills (Meghalaya) and Cachar (Assam) have been restudied. The assemblage consists of 18 genera and 34 species including 5 new species. A manuscript incorporating the description of the above assemblage and its comparison with the already known contemporaneous assemblages was finalized and submitted for publication.

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

Nine genera and 15 species (including 2 new species) of the dinoflagellate cysts obtained from the Barail (Oligocene) and Surma (Lower Miocene) sediments exposed along Sonapur-Badarpur Road Section in Jaintia Hills (Meghalaya) and Cachar (Assam) were studied and a manuscript dealing with their systematic description was finalized. The distribution of these cysts has been discussed in detail. This paper has been submitted for publication.

R. K. Saxena and M. R. Rao

On the basis of the frequency analysis and palynomorph distribution, the Barail-Surma sequence of Sonapur-Badarpur Road Section has been divided into six cenozones. A manuscript incorporating the formal description of these zones according to the stratigraphic code, accompanied by a range chart, was finalized and submitted for publication.

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

A manuscript dealing with '*Surmaspora*, a new pteridophytic spore genus recovered from the Tertiary sediments of Meghalaya and Assam' has been finalized and submitted for publication. The miospores referred to the newly established spore genus *Surmaspora* have been recovered from the Upper Bhuban Formation exposed along the Jowai-Badarpur Highway. In morphological characters *Surmaspora* has trilete rays surrounded by a thick labra having globular thickening at the ray-ends with verrucose exine.

H. P. Singh and M. R. Rao

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

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

Palynological studies of the Palaeogene sediments from the Lesser Himalaya and the Indus Suture Zone have provided interesting information. This information is being analysed for its utility in zonation, dating, correlation, palaeoecology and palaeoclimatology.

H. P. Singh

A morphotaxonomic study of the Subathu palynomorph assemblage recovered from the Dadahu and Jhamuta areas in Sirmur District of Himachal Pradesh was continued. Fungal spores have been studied in detail. A paper on 'Some observations on the genus *Aplanosporites* Kar' was under preparation.

H. P. Singh and Asha Gupta

A paper dealing with the 'Palynology of Subathu Formation (Eocene), Banethi-Bagthan area, Himachal Pradesh India' was under preparation. It deals mainly with the detailed morphotaxonomic studies of the palynofossils recovered from the Subathu sediments of Banethi-Bagthan area.

Samir Sarkar and H. P. Singh

Based on the qualitative and quantitative analyses of the palynomorph assemblages, five distinct palynozones have been identified in four different geological sections of the Subathu Formation in Benethi-Bagthan area of Himachal Pradesh. The observations and results were incorporated in a paper on the 'Palynostratigraphy of the Subathu Formation, Benethi-Bagthan area, Himachal Pradesh, India'.

H. P. Singh and Samir Sarkar

A paper on 'Significant palynozones of Subathu Formation (H. P.) and their bearing on stratigraphy' was finalized. It deals with the distributional pattern of palynoassemblages in the Kalka-Simla and Banethi-Bagthan areas of Himachal Pradesh.

A manuscript on 'A microplankton assemblage from the Koshalia River Section near Koti, Himachal Pradesh' was under preparation. It deals mainly with the morphotaxonomic study of the recovered palynomorphs.

H. P. Singh and Samir Sarkar

The samples collected from Dharamsala Group exposed along Bhagsu Nag-Dharmsala Road Section in Kangra District of Himachal Pradesh were processed. The scanning of slides made from the productive samples of the Dharamsala Group exposed along Manji Khad Section, Khunyara-Dharamsala Road Section, Charan Khad Section and Bhagsu Nag-Dharmsala Road Section has also been completed. The study of palynomorphs recovered from the Manji Khad Section was continued.

R. K. Saxena and A. P. Bhattacharya

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*

Palynofloral assemblages from the Lower Siwalik (Nahan) and Upper Siwalik sediments of Kala Amb-Nahan area in Sirmur District of Himachal Pradesh were studied. The palynoflora consists of 20 genera and 29 species including 3 new species and one new combination. The diagnosis of three genera, viz., *Inaperturopollenites*, *Inapertusporites* and *Dicellaesporites* have been emended. The assemblages have been compared with the known Lower and Upper Siwalik assemblages respectively in order to

discuss their stratigraphic significance. A manuscript incorporating the results of this study was written and a geological map of the area was prepared. Photomicrography of the recovered palynomorphs has also been completed.

R. K. Saxena and A. P. Bhattacharya

Seven species of the genus *Frasnacritetrus* have been recovered from seven Tertiary stratal sequences in Himachal Pradesh and their morphological study was carried out. Two new species, viz., *F. taugourdeaui* and *F. conatus* have been proposed. The diagnosis of the genus has been emended and the interspecific morphological variations amongst the various species, e.g. variations in shape, size, structure and ornamentation of the body and also in shape, size, number, septa and ornamentation in the processes have been studied. The stratigraphic distribution of the various species was studied and its significance commented. A map showing the location of the various sections studied was also prepared A paper incorporating the interesting results of above study has been finalized and submitted for publication.

R. K. Saxena and Samir Sarkar

Chemical processing of 20 samples collected from the Chandi Devi Road Section and 23 samples pertaining to the Mansa Devi Road Section (Middle Siwalik), Hardwar was done. Out of them 14 and 17 samples respectively proved to be productive. The recovery of palynomorphs particularly from the Mansa Devi Road Section seems to be good. The identification of the palynomorphs was continued.

S. K. M. Tripathi

About 36 rock samples collected from the Masol-Kiratpur Section (Upper Siwalik, Tatrot and Pinjor) were chemically processed. Out of them, 18 samples proved to be productive. The identification of the palynomorphs has been taken up.

M. R. Rao

Department of Planktonology

Project : *Marine microplankton biostratigraphy of the 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*

Morphotaxonomy of dinocyst taxa from Trichinopolly Formation, Cauvery Basin was continued and the following 10 genera: *Hystrichodinium, Coronifera, Oligosphaeridium, Cleistosphaeridium, Aptea, Odontochitina, Exochosphaeridium, Canningia, Tanyosphaeridium* and *Cyclonephelium* were identified.

K. P. Jain and Khowaja Ateequzzaman

Morphotaxonomy and microphotography of Palaeogene dinocysts from Karikal Well-9 have been undertaken. The Upper Palaeocene marker dinocyst taxa belonging to *Apectodinium homomorphum* plexus have been identified alongwith a few other significant taxa, viz., *Wetzeliella cleothrypta, Lejeunia hyalina* and *Areoligera coronata.*

Rahul Garg and K. P. Jain

A manuscript on 'Reappraisal of the genus *Muderongia* Cookson & Eisenack, 1958' has been completed and submitted for publication. The study is based on 300 well-preserved specimens, identified to be *Muderongia mcwhaei,* the type species of the genus, recovered from a bore-hole sample drilled at Puduvoyal, Chingleput District, Tamil Nadu in Palar Basin. Out of 14 known species of the genus only six are maintained and the others are discussed.

K. P. Jain and Khowaja Ateequzzaman

A manuscript on the 'Dinocyst genus *Discorsia* Duxbury : A reinterpretation' was completed.

Khowaja Ateequzzaman, S. B. Manum and K. P. Jain

A paper dealing with the 'Fossil flora of the Kachchh Basin—Jurassic dinoflagellates' was completed. The dinocyst taxa were recovered from various members of the Jhuran Formation exposed at a number of localities in the Kachchh Basin. The assemblage comprises 27 species. On the basis of quantitative and qualitative analyses, the age of the dinocyst assemblage is concluded to be Upper Oxfordian to Kimmeridgian, probably extending up to *P. pectinatus* zone.

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

Morphotaxonomy of Jurassic dinocysts from Kachchh have been undertaken. Microphotography and identification of dinocyst taxa was continued. The productive material represents the Jhuran Formation.

K. P. Jain and Rahul Garg

Project : *Nannoplankton biostratigraphy of marine sedimentation 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*

A detailed synonymy list was prepared from 55 species of calcareous nannoplanktons recovered from a well-preserved sample of Ratchelo Nala Section of Late Middle Eocene age. Out of them 9 species have been recognised as new. Besides, 20 samples from Nareda, 4 samples from Lakhpat, 19 samples from Babia Hill and 42 samples from Guar Nala were studied to observe the Nannofloral preservation and taxonomic diversity in lateral facies variants of coeval age in Kachchh Basin. A manuscript on the study was under finalization.

S. A. Jafar and Jyotsana Rai

Various members of the Vagadkhol Formation (=Mujlao Formation) and Bodhan Formation were studied in type sections around Tarakeshwar town in Surat Area. Sampling was done in favourable lithologies. The studies indicated the presence of only couple of meters thick strata than hitherto believed and suggest a short lived marine transgression along Tapti lineament during late Eocene times. Rapid lateral changes in lithology requires rejection of most member rank lithounits earlier established in Surat area. The nannoflora recovered from the productive samples are being documented under the light microscope for precise dating and placement under standard nannoplankton zonation.

S. A. Jafar and Jyotsana Rai

A new species as well as a new genus alongwith 31 species recovered from the samples of basal part of Jhumara Formation (=Chari Formation) in its type area of Kachchh basin were recognized. A detailed synonymy list of this late Bathonian calcareous nannoplankton assemblage was prepared laying the emphasis on the recognition of potential stratigraphic markers and facies controlled species. A manuscript on the study is being written.

S. A Jafar and Rajesh K. Saxena

Department of Post-Gondwana Palynostratigraphy of Peninsular India

Project : *Palynostratigraphy of Neogene sediments in Kachchh*

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

On the basis of relative dominance of the palynomorphs, the Khari Nadi Formation (Miocene) was divided into (i) *Cordosphae-*

ridium-Cantharellum, (ii) *Striatriletes susannae*, and (iii) *Operculodinium israelianum* cenozones. The first and third cenozones are dominated by microplanktons indicating the marine influence. The second one, on the other hand, generally represents pteridophytic spores and gymnospermous pollen. The significant species in the first cenozone are: *Cordosphaeridium cantharellum, Operculodinium centrocarpum, Tuberculodinium vancampoae, Spiniferites bulloideus, Millioudinium unicornum, Cordosphaeridium exilimurum* and *Abiespollenites cognatus*.

Striatriletes susannae Cenozone comprises *Azolla aglochidia, Podocarpidites densicorpus, Psiloschizosporis psilata, Striatriletes aidaensis, Striatriletes paucicostatus, Khariasporites densus, Abiespollenites cognatus, Piceapollenites excellensus, Tsugaepollenites velatus, Operculodinium centrocarpum, Biretisporites convexus* and *Dictyophyllidites laevigatus*.

Operculodinium centrocarpum Cenozone consists of *Cordosphaeridium cantharellum, Operculodinium paucispinosum, Striatriletes susannae, Operculodinium israelianum, Aplanosporites robustus, Cordosphaeridium exilimurum, Cordosphaeridium fibrospinosum, Psiloschizosporis psilata, Podocarpidites densicorpus* and *Piceapollenites excellensus*.

R. K. Kar

Project : *Palynostratigraphy of Deccan Intertrappean beds from Rajmundri to Bombay*

Objective : *To locate palynological productive horizons for morphotaxonomical study*

The microphotography of the palynomorphs recovered from Sonrai, Lalitpur District, Uttar Pradesh and Mandru, Madhya Pradesh was completed.

R. K. Kar

Project : *Palynostratigraphy of the Tertiary sediments in Kachchh (monographic studies)*

Objective : *To write a monograph on the palynostratigraphy of the Tertiary sediments of Kachchh*

The monographic study on the Tertiary palynostratigraphy of Kachchh was completed. Palynological work so far done on the different Tertiary sediments of Kachchh was reassessed and new information added. A number of genera were redefined and new proposed genera are: *Intrareticulites, Retitribrevicolporites, Dermatobrevicolporites, Triangulorites, Arengapollenites, Minutitricolporites, Acanthotricolpites, Angulocolporites, Pseudonyssapollenites, Pilatricolporites, Tribrevicolporites, Triangulotricolporites, Retitetrabrevicolporites, Tripilaorites, Ligulifloraedites, Spinulotetradites, Verrudandotiaspora, Tricolporopilites, Tricolporocolumellites, Ratariacolporites, Plicatiaperturites, Palaeomalvaceaepollis, Pilapanporites, Verrupolyporites, Khariasporites, Magnamonocolpites* and *Hibisceaepellenites*.

On the basis of relative percentage of palynomorphs, the Matanomadh Formation (Palaeocene) was divided into: (i) Barren Zone, (ii) *Dandotiaspora dilata* Cenozone, (iii) *Tricolpites minutus* Cenozone, (iv) *Couperipollis kutchensis* Cenozone, and (v) sponge spicules Zone. Besides, the Naredi Formation (Lower Eocene) has been divided into (i) *Lakiapollis ovatus* Cenozone, and (ii) *Lygodiumsporites lakiensis* Cenozone. The palynological assemblage from the Harudi Formation (Middle Eocene) was also subdivided into (i) *Proxapertites microreticulatus*, and (ii) *Cheilanthoidspora enigmata* Cenozones. For Maniyara Fort Formation (Oligocene) the cenozones proposed were: (i) *Operculodinium centrocarpum* Cenozone, (ii) *Trisyncolpites ramanujamii* Cenozone, and (iii) *Aplanosporites robustus* Cenozone.

In Khari Nadi Formation (Miocene) the cenozones proposed were: (i) *Cordosphaeridium cantharellum* Cenozone, (ii) *Striatriletes susannae* Cenozone, and (iii) *Operculodinium israelianum* Cenozone.

In all, there are about 179 spore-pollen species in Kachchh during Palaeocene to Miocene. Amongst them, 42 species were confined to Palaeocene, 39 species to Eocene, 25 species to Oligocene and 21 species to Miocene. The Lower Eocene exhibits maximum number (113) of spore-pollen species. The population gradually decreases from Middle Eocene to Oligocene and in Miocene only three species of angiosperms are recorded. On the basis of morphological characters of spores and pollen grains the families—Pakeriaceae, Amaranthaceae-Chenopodiaceae, Clusiaceae, Bombacaceae, Malvaceae, Ctenolophonaceae. Polygalaceae, Alangiaceae, Apiaceae, Asteraceae, Poaceae, and Arecaceae could be recognized.

An atlas on 'Selected Tertiary angiosperm pollen from India and their relationship with African Tertiary pollen' was compiled. In this work, 43 genera have been redescribed and illustrated after a critical study of several type specimens. The genera selected for inclusion in this atlas are: *Anacolosidites, Clavaperiporites, Conopollis, Coramandalipollis, Couperipollis, Crotonoidaepollenites, Ctenolophonidites, Dicolpopollis, Graminidites, Iugopollis, Kielmeyerapollenites, Lacrimapollis, Lakiapollis, Liliacidites, Longapertites, Loranthipites, Malvacearumpollis, Marginipollis, Margocolporites, Meliapollis, Meyeripollis, Ornatetradites, Palmaepollenites, Paravuripollis, Pellicieroipollis, Polybrevicolporites, Polycolpites, Polygalacidites, Proxapertites, Pseudonothofagidites, Psilodiporites, Quilonipollenites, Retipollenites, Retistephanocolpites, Spinizonocolpites, Striacolporites, Tricollareporites, Trilatiporites, Trisyncolpites, Umbelliferoipollenites, Verrucolporites, Warkallipollenites* and *Zonocostites.*

R. K. Kar

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

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

A few more samples (Leg. 22, site 218) from the Bengal Fan were remacerated for better results. In a few more samples the

microplanktons have been found. A chart showing the position of the core samples at various depth has also been prepared.

Anil Chandra

Deep core samples recovered from the sites 214, 216 and 216A belonging to Leg. 22 of the Bengal Fan were macerated. Miospore representation in these samples is very poor. A few samples yielded the microplanktons and the microspores.

S. B. Manum, R. K. Kar and Anil Chandra

A manuscript pertaining to the palynological investigation of the grab samples collected from the continental shelf and slope off Karnataka was completed. In general, the pollen/spores recovered from these sediments are comparable to those of the corresponding coastal vegetation. The concentration of the pollen/spores is higher in the near coast sediments. Pollen/spores were observed up to 123 km off the coast.

Ram Ratan and Anil Chandra

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*

The palynological assemblage recovered from the Upper Cretaceous sediments of Meghalaya comprises 61 genera and 104 species. Pteridophytic spores were dominant and contribute 69 genera and 68 species. Gymnosperms were represented by 8 genera and 11 species; angiosperm pollen have been assigned to 10 genera and 20 species. In all, 8 sections were studied comprising the Jadukata and Mahadek formations. The quantitative and qualitative abundance of different species were plotted separately for each section. The Jadukata palynological assemblage

were divided into (i) *Araucariacites-Densoisporites* and *Araucariacites-Gleicheniidites* zones and Mahadek Formation into *Araucariacites-Aridnaesporites* zone.

R. S. Singh

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 palynomorphs isolated from Baragolai were photographed and described systematically.

Jagannath Prasad Mandal

Important palynological taxa recovered from the Lakadong Formation and Laitryngew Coalfield were photographed. Of them, *Dandotiaspora, Biretisporites, Cyathidites, Lycopodiumsporites, Corrugatisporites, Schizaeoisporites, Palmidites, Liliacidites, Inaperturopollenites, Tricolpites, Retitricolpites. Retistephanocolpites, Nyssapollenites, Triporopollenites, Margocolporites, Droseridites* and *Kielmeyerapollenites* were identified.

Madhav Kumar

A rich palynological assemblage was recovered from the Ledo Colliery of Makum Coalfield. The provisionally identified genera are: *Cyathidites, Glecheniidites, Lycopodiumsporites, Osmundacidites, Deltoidospora, Todisporites, Striatriletes, Laevigatosporites, Polypodiaceaesporites, Polypodiisporites, Podocarpidites, Pinuspollenites, Graminidites, Ilexipollenites, Nyssapollenites, Meyeripollis* and *Palmaepollenites.*

B. D. Mandaokar

About 125 samples from the Kopili Formation were macerated, out of which 80 samples were found productive. Further work was continued.

G. K. Trivedi

Project : *Palynostratigraphy of the Tertiary sediments of Andaman Islands*

Objective : *To trace the origin and development of angiospermic flora in Andamans and to establish different palynological zones*

Maceration of about 124 rock samples belonging to Baratang Formation (Eocene-Oligocene) and mud volcanoes of Baratang Island, Middle Andaman was done. Of them, only 24 samples were found productive. The microfossils recovered are mostly different from the main land.

R. K. Kar, Anil Chandra and Jagannath Prasad Mandal

Department of Biodiagenesis

Project : *Biopetrology of Indian coal deposits*

Objective : *Evaluation of coals for classification and utilization*

Subproject : *Biopetrology of Lower Gondwana coal of Raniganj Coalfield, West Bengal*

A manuscript on the biopetrological studies of coal samples from bore-holes C.M.P.-304/GRT/OV/79, CMP-302/DMM/OV/79 and MEC-269/55/OV/79 was under preparation.

G. K. B. Navale, Anand Prakash and B. K. Misra

Subproject : *Biopetrology of Lower Gondwana coals of West Bokaro Coalfield, Bihar*

Coal samples studied from three bore-holes have been assessed petrologically and a paper on the study has partly been completed. Rank determination of these coals by reflectance measurements was also done and a paper on the study has almost been finalized.

G. K. B. Navale and Rakesh Saxena

Subproject : Biopetrological studies of East Bokaro coals

Apart from old collections, fresh collections have also been made for the assessment of these coals on the basis of coal constituents. Three pellets have also been studied statistically. Further work was continued.

G. K. B. Navale and Rakesh Saxena

Subproject : Biopetrological and chemical studies of Lower Gondwana coals of Singrauli Coalfield, Madhya Pradesh

Rank determination and quantitative assessment of the coal microconstituents on 45 particulate pellets of bore-hole no. NCSJ-4 have been completed. Quantitative assessment of macerals and microlithotypes on 35 coal pellets from bore-hole no. NCSM-3 and 19 coal pellets from bore-hole no. CMSA-11 has also been completed. Compilation, calculation and tabulation of petrographic data of these coals alongwith rank data of bore-holes NCSJ-4 and NCSM-3 were also carried out. Some preliminary plottings utilizing biopetrological data of these coals were prepared for evaluation and correlation of the coal seams. Photomicrography has also been done selectively.

Proximate analysis (fixed carbon, volatile matter, ash and moisture contents) of about 100 samples from three bore-holes (NCSJ-4, NCSM-3, CMSA-111) have been carried out. Calculation, tabulation and preliminary plottings of proximate constituents data of these samples have also been completed.

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

Subproject : Biopetrology of Lower Gondwana coals of Giridih Coalfield, Bihar

A manuscript dealing with the biopetrological studies of Giridih coals is being finalized.

Anand Prakash

Subproject : Classification of Indian coal deposits

A large number of maceral data were compiled and ratio between vitrinite and intertinite macerals were obtained and plotted to ascertain the prospect of the V/I ratio in regional correlation of coal from Karharbari, Barakar and Raniganj formations of the Indian Lower Gondwana sequence. A manuscript on the 'Significance of vitrinite/inertinite ratio in the Lower Gondwana coal of India' was completed.

A large number of maceral and rank data (approx. 350) of Lower Gondwana coals from various coal basins of India have been plotted using different parameters to ascertain the nature and typology of these coals.

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

Synthesis of the recent advances made on organic constituents and their compositional patterns in Peninsular Lower Gondwana coal basins has been made establishing 3 main basic coal types such as fusic, mixed and vitric. Environmental factors, such as humidity, temperature and water level, have been discussed in variable coalification during Lower Gondwana coal formations.

G. K. B. Navale

Subproject : Biopetrology of Mesozoic coals of Kachchh, Gujarat

A paper on the 'Nature, composition and rank (maturation) of the Mesozoic coals from Kachchh, Gujarat' has been finalized and submitted for publication.

Anand Prakash

Subproject : Study of dispersed organic matter of the sedimentary rocks

The carbonaceous shales collected from one section of the Jhuran Formation exposed in Jhuran River near Jawahar Nagar,

Kachchh have been studied. The samples mainly contain small fragments of vitrinite and fusinite, macerals embedded in argillaceous matrix.

Anand Prakash and Rakesh Saxena

Subproject : Biopetrology and maturation (rank) studies of some Tertiary coals from Nazira Coalfield, Nagaland

Rank determination and quantitative assessment of the coal microconstituents (macerals) on particulate pellets have been completed. Besides, photomicrography has also been done. The study revealed that these coals have very high vitrinite and low exinite, intertinite and mineral matter contents like other Tertiary coals from Upper Assam (Makum and Dilli-Jeypore coalfields). The coals are low in rank and have attained high volatile bituminous C stage.

B. K. Misra

Subproject : Biopetrology and rank determination of Tertiary coals from Upper Assam

Particulate coal pellets from the samples of thin coal seams of the Baragolai Formation (Barail Group-Oligocene) exposed in Namdang River Section of Makum Coalfield were quantitatively analysed by microphotometric method for their maceral contents and rank determination. Photomicrography has also been done selectively. These coal samples, like coals of the overlying Tikak Parbat Formation contain very high amount of vitrinite, low amount of exinite and intertinite macerals and comparatively high amount of mineral matter. They are low in rank which approximates to high volatile bituminous C stage.

B. K. Misra

Subproject : Fluorescence microscopy of Indian coal deposits

Three particulate coal pellets from Nazira Coalfield, Nagaland and four pellets from a thin coal seam of Baragolai Formation (Barail Group) exposed in Namdang River Section of the Makum coalfield, Upper Assam were thoroughly scanned under incident fluorescent light with both u/v and blue light irradiation for assessing the exinite and other hydrogen-rich microconstitutents. Photomicrography was also completed. The study revealed that these Tertiary coals are defficient in microsporinite and cutinite contents unlike Lower Gondwana coals of Peninsular India. Whereas, common occurrence of resinite and other unidentifiable waxy/resinous material (darker than associated vitrinte macerals) have been observed.

B. K. Misra

Subproject : Palynological studies of Raniganj coals, West Bengal

A paper dealing with the palynological and petrological studies of bore-hole samples C.M.P.-304/G.R.T./OV/79, C.M.P.-302/D.M.M.-OV/79 and M.E.C.-296/SS-OV/79, Raniganj Coalfield, West Bengal is being finalized.

G. K. B. Navale, Anand Prakash and B. K. Misra

Subproject : Palynostratigraphy of Lower Gondwana sediments in West Bokaro Coalfield, Bihar

A complete correlation of Barakar coal seams in space and time has been established on the basis of palynofloristics. A manuscript on the study is being written. Another paper dealing with the climatic oscillations during Talchir and Karharbari times has partly been completed.

Palynofloristically, Barren Measures and Raniganj have been delimited in the coalfield for the first time and a paper has partly been completed.

Complete biostratigraphy dealing with the Lower Gondwana sequence on measured sections and bore-hole studies have been carried out and a paper incorporating the results of the study has been finalized.

Rakesh Saxena and Suresh C. Srivastava

Subproject : Palynostratigraphy of Lower Gondwana sequence in East Bokaro Coalfield, Bihar

The scanning of 20 samples have been completed. Some of the samples have been remacerated for better results. Further work was continued.

Rakesh Saxena and Suresh C. Srivastava

Subproject : Scanning electron microscopy of organic material

The material for such studies has been collected from Barakar Formation of the Lower Gondwana Sequence and few characteristic forms have been picked up. A new technique has been evolved up to stub preparation for studying the fossil pollen and other constituents. The detailed study of *Arasporites* and *Gondisporites* has been completed and a paper was prepared.

Rakesh Saxena

Subproject : Palynostratigraphy of the Lower Gondwona sediments in Satpura Basin, Maohya Pradesh

Maceration of the samples collected from Harashadwar Nala Section and the area nearby Bijori Village (Bijori Formation) has been completed. Besides, 31 samples which were collected from the museum and Talchir Formation (Betul Coalfield) were macerated. Eight slides per productive samples were prepared. The slides were scanned and the important miospores were photographed, described and identified up to specific level. Counting

of the mioflora from Talchir Formation has been done and the results were compared with the known Talchir mioflora. Some specimens which were marked as new species were also studied. The sporae dispersae of Pathakhera, Betul and Sukhtawa area of Satpura Basin has been described. In all, 41 genera and 92 species have been recorded, out of which five species are new. A first draft manuscript on the 'progress of palaeopalynology in Indian Lower Godwanas' alongwith the general geology of Satpura Basin were written.

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

Subproject : Palynostratigraphy of the Turra Seam from Gorbi Colliery, Singrauli Coalfield, Madhya Pradesh

Out of the 33 coal samples collected from two benches of Gorbi Colliery 16 samples were macerated twice to obtain miospores. The miospore assemblage recovered from the Turra Seam is dominated by *Seheuringipollenites* with varying percentage of striate-disaccates and apiculate triletes. Occurrence of the *Ginkgocycadophytes* in fair quantity at the base of the 2nd bench is notable. On the basis of dominant and associated miospore genera the age of the Turra Seam of Gorbi Colliery corresponds to middle Barakar.

Vijaya Singh, B. K. Misra and B. D. Singh

Project : Palynopetrographic study of organic remains of coastal and Upcountry lignites

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

For the palynological assessment all the slides prepared from the lignite samples from bore-hole NLE-35 and NLE-36, have been scanned. Morphographic description of miospores recovered

from the productive samples of I, I A and II Lateral Section and bore-holes NLE-27, NLE-35 and NLE-36 were completed. Tentative identification of the miospores up to generic level has also been done. Quantitativea ssessment of miospores in bore-hole NLE-27 have been completed.

Quantitative assessment of organic entities (including miospores) in all the lignite samples from three bore-holes NLE-27, NLE-35 and NLE-36 has been completed. Quantitative assessment of recovered organic matter in sieved and non-sieved samples (8 samples) has been done to assess the quantitative difference between the two. Relative frequencies of organic matter in each sample assessed quantitatively from three bore-cores NLE-27, NLE-35 and NLE-36 have been graphically represented. Photomicrography of some interesting miospores was also 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 pollen zonation schemes and dating of geological and ahrcaeological samples*

Radiocarbon measurements have been carried out on 73 samples which include 8 background and 4 anthracite preparations. Besides, 43 samples from the Quaternary deposits and 18 samples from the archaeological excavations have been dated.

Silent Valley—Seven samples from different profiles have been dated. The deposit is only 750 years old at a depth of 60 cm.

These ages agree well with dates from two other profiles investigated earlier. The reddish clay sample (depth 15-25 cm) dated to 1770 ± 130 yrs B. P. is therefore anomalous and was probably contaminated with older carbon materials.

Quilon—Peat, wood and sediment samples from Kallada Basin have been dated for geomorphological studies. The peat sample at 9 m depth is dated to 6260 ± 120 yrs B. P.

Thana District—Wood and shell samples (8 samples) recovered from different profiles have been dated which have indicated the sea level changes in the past 6,000 yrs along the west coast of India.

Valley of flowers—Samples of black soil rich in organic matter from the glacial deposits have been dated to 460 ± 100 yrs (depth 55 cm), 620 ± 90 yrs (depth 65 cm) and 720 ± 90 yrs (depth 75 cm) to trace the glacial history of the region.

Meghalaya—Two samples of peat were dated for the studies relating to Quaternary stratigraphy of Lower Brahmaputra Valley. The sample at 9.5 m depth dates to 40,000 yrs. In addition, one sample of wood piece buried at a depth of 4 m, indicative of the landslide phenomenon associated with earth quake, was dated to 1,190 ± 100 yrs agreeing well with the age of wood trunk dated elsewhere The sample was dated for the project on earth quake prediction studies.

Nepal—Two samples of sediment with wood pieces from Pokharo have been dated to 390 ± 110 yrs (sample no. 523) and 510 ± 140 yrs (sample no. 525)

Miliolites—Nine more samples of miliolite from Saurashtra Coast were dated to understand the effect of contamination due to modern carbon in these formations. The ages of these samples vary from 7,260 yrs to 33,170 yrs confirming the earlier results.

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*

Mineral separation for F-T dating—Frantz isodynamic magnetic separator was installed and used to seperate minerals, e.g. glauconite, apatite, muscovite, biotite, etc. from rock samples. The value of horizontal and vertical angle settings, magnetic current and vibration frequency have heen established for various minerals.

Studies on etching characteristics—The dependence of optimum etching time with chemical composition was studied and a plot of induced track density (Pi) vs. etching time (Te) was drawn for eight glauconite samples (BSFT 46—BSFT 53) from different locations (two samples from Mirzapur, three samples from Jabalpur and three samples from Kachchh). The optimum etch-time was found to be same, 35 min. within the range of 30 sec., for all the glauconite samples irrespective of their source.

Dating of Lower Vindhyan sediments—Dating of five glauconite samples from three different localities (Lodhwara, Sangrampur and Muradpur hillock) at Chitrakut, Banda District (U P.—M.P.) has been carried out. BSFT 68 and BSFT 69 at 1 m and 8 m height respectively from the base granite at Lodhwara hillock have given F-T age of (1264 $\pm$ 171) and (1036 $\pm$ 151) Ma respectively. At Sangrampur hillock two samples BSFT-71 and BSFT-72 at the height of 4 m and 7 m from base granite have been found to be 1248 $\pm$ 201 and 1074 $\pm$ 164 Ma old respectively. Only one sample BSFT-70 at Muradpur, just above the base granite was dated at 1360 $\pm$ 199 Ma. These data give a F—T age bracket for Semri Group deposit at Chitrakut at 1030-1360 Ma which is in good agreement with K-Ar age measurements. The base Bundelkhand granite was also dated after separating biotite,

apatite and muscovite which give F-T ages at 1606 ± 135 1622 ± 72 and 1729 ± 97 Ma at Lodhwara and 1610 ± 145, 1628 ± 106 and 1732 ± 101 Ma as Sangrampur hillocks. The uranium concentration in these minerals is found to be in ppb level except in apatite which is in ppm level.

The dating of 11 glauconite samples collected from Machacharmara Section, Chopan, Mirzapur District has also been done. One sample (BSFT-54) obtained from the lowermost thin glauconitic bed has give an age of 1344 ± 147 Ma. The age of other 10 samples (BSFT-55 to BSFT-64) which have been collected from the same bed at different places revealed good internal consistency and the age of the bed is found to be 1134 ± 59 Ma. The uranium cocentration is fonnd to be same as in Chitrakut glauconite at 3 ppb.

Fossil wood—Datings of three petrified wood samples from different localities were carried out on in-situ apatite grains. Sample BSFT-76 collected from the Singrauli Coalfield has given a F-T age of (283 ± 57) Ma. The samples from Rajmahal trap (BSFT-74) and Jaisalmer (BSFT-77) were dated at 53±8 and 46 ± 12 Ma respectively.

G. Rajagopalan, H. S. Saini and A. P. Srivastava

Research in Collaboration

North-west Himalaya

A paper entitled 'The Precambrian-Cambrian boundry and its prospects, North-west Himalaya, India' was submitted for publication. Cryptarch, viz., *Protosphaeridium, Kildinella, Orygmatosphaeridium, Lophosphaeriaium, Symplassosphaeriaium, Granomarginata* and *Vindhyasphaeridium* have been identified from Lolab Valley, Kashmir (with Geological Survey of India; Northern Region, Himalayan Geology Division).

Plant megafossils from Lower Gondwana of eastern Himalaya

Some more megafossils collected from the area were examined (with Wadia Institute of Himalayan Geology, Dehradun).

Plant megafossils from Ladakh

A paper 'On some *Cladophlebis*-like fronds from Koyul, eastern Ladakh, India' was finalized (with Wadia Institute of Himalayan Geology, Dehradun).

Another paper entitled 'Mesozoic plant remains from Fukhe, Ladakh' has also been finalized (with Wadia Institute of Himalayan Geology, Dehradun).

Tertiary of Zaire, Congo

Description and photography of nearly 12 decotyledonous fossil woods from the Tertiary of Zaire were completed and the manuscript is being written (with Museé Royal de l' Afrique Centrale, Tervuren, Belgium).

Detailed studies on two fossil palm woods from the Tertiary of Zaire was also taken up. The anatomical observations have been completed (with Museé Royal de l' Afrique Centrale, Tervuren, Belgium).

Tertiary of G. D. R.

A fossil palm stem, *Palmoxylon daberi* sp. nov. from the West coast of Hiddensee, East Germany was described (with L. Ruffle, G. D. R.).

Tertiary of Palamau District, Bihar

The study of a collection of leaf-impressions and fossil dicotyledonons woods from the Tertiary of Palamau District, Bihar was continued (with Geological survey of India, Northern Region, Lucknow).

Tertiary of Ladakh

A leaf-impression of the genus *Livistona* from the late Eocene-Oligocene (Hemis Conglomerate Horizon) sediments of Ladakh and a fossil wood resembling *Prunus* of the family Rosaceae from the Miocene (Liyan/Kargil Formation) beds of Ladakh were investigated. The later forms the first megafossil record of a temperate dicot wood from the area and confirms that northern temperate elements started establishing in North India during Miocene. It also provides evidence of considerable uplift of the Himalaya (with Wadia Institute of Himalayan Geology, Dehradun).

Kashmir

Four papers on palynostratigraphy and palaeoenvironments, one each of Ningle Nullah, Dubjan, Krachipathra, and Hirpur Loc. III. were prepared and submitted for publication. A paper on 'a palynological interpretation of climatic changes in Kashmir, India' during the past three million years and another on 'a new pollen type *Arecicolpites hirpurensis* gen. et sp. nov. from Hirpur Formation, Lower Karewa, Kashmir Valley were also finalized and submitted for publication (with National Physical Research Laboratory, Ahmedabad).

Permo-Triassic boundary in Damodar Basin

Study of more bore-cores from Damodar Basin was continued (with Geological Survey of India, Coal Division).

Gondwana of Arunachal Pradesh

A detailed study of sporae dispersae of the Lower Gondwana sediments of Arunachal Pradesh was continued (with Wadia Institute of Himalayan Geology, Dehradun & Department of Applied Geology, Dibrugarh University .

Kopili-Barail transition

About 124 samples of Lakwa bore-core no. 22 were macerated. Slides of the productive samples were also prepared (with Oil and Natural Gas Commission, Dehradun).

Neogene sediments of Assam

Palynological fossils so far known from the Neogene sediments of Assam were listed and the pertinent literature was consulted (with Oil and Natural Gas Commission, Dehradun).

Subsurface sediments from Kerala

Six bore-core samples (567-467 m) were macerated. On the basis of palynomorphs, Eocene age was assigned to these samples (with Centre for Earth Science Studies, Trivandrum).

Subathu Formation, Jammu

A paper entitled 'Stratigraphical significance of dinocysts from the Subathu Formation of Jammu' has been finalized. It reports the occurrence of dinocyst assemblages for the first time from this area. The assemblages have been compared with those known from the type locality, Subathu town, Simla Hills, Himachal Pradesh (with Wadia Institute of Himalayan Geology, Dehradun).

Detailed morphotaxonomic study of the Subathu palynomorphs recovered from the Jammu area was continued (with Wadia Institute of Himalayan Geology, Dehradun).

Arunachal Pradesh

Chemical processing of 18 samples from Arunachal Pradesh was done. Out of 18 samples, only 14 samples were proved productive. A few samples reveal the presence of Lower Tertiary palynomorphs (with Wadia Institute of Himalayan Geology, Dehradun).

Tertiary of Ladakh and Leh

Maceration of Tertiary samples collected from Ladakh and Leh was done. Chemical processing of Garhwal Geosyncline samples (Upper Cretaceous)? was also done.

Palynology of the Mesozoic sediments of Kachchh Basin

A paper incorporating sedimentologic and palaeontologic data including nannofloral evidence was finalized. In this paper

a new model on the palaeoenvironment and stratigraphic framework of Kachchh sedimentaries was suggested. A detailed study on a well-measured section of Ler Section in Kachchh Basin was completed and a quantitative assessment of the nannoflora was made to evolve a model of plankton distribution in the coastal Jurassic sea. The manuscript is being written (with Geology Department, Lucknow University & Skidway Institute of Oceanography, Georgia, USA).

Palynological samples were collected from the Kanthkot Formation (Wagad Highland), Kachchh Basin. Permanent slides were prepared for the study of productive horizons of calcareous nannoplankton (with Oil and Natural Gas Commission, Dehradun).

Samples collected from Gajensar area proved productive. Some significant dinocyst taxa were identified in the assemblage. The work to build up the biostratigraphy of Jhuran Formation was continued. All the samples representing Jhurio and Jhumara formations proved to be barren of dinocysts (with Oil and Natural Gas Commission, Dehradun).

Malla Johar area, District Pithoragarh

The biostratigraphic and palaeoenvironmental conclusions of the study have been finalised based on the organic walled microfossil from the Spiti Shale sequence. A manuscript on the 'Upper Jurassic dinoflagellate biostratigraphy of Spiti Shale (Formation), Malla Johar area, Tethys Himalaya, India' is being written with (Department of Geology, Lucknow Universit)y.

Arunachal Pradesh

Biopetrological and maturation studies on eastern Himalayan Lower Gondwana coals from Kameng District, Arunachal Pradesh have been finalized.

A report on the quantitative assessment of the organic microconstituents of the Main seam from Nangalbibra Colliery, Meghalaya has been compiled (with Geology Department, Gauhati University, Assam).

Biopetrological and maturation studies of Darjeeling, Sikkim and Arunachal coals were carried out (with Wadia Institute of Himalayan Geology, Dehradun).

Out of 21 coal and carbonaceous shale samples from the area, only 16 samples were found suitable for petrological studies. The maceral and microlithotype analysis of these samples have been completed (with Wadia Institute of Himalayan Geology, Dehradun).

Birbal Sahni Research Scholar

Project : Tertiary flora of India

Megafossils—A hydrophytic root belonging to the family Gramineae has been described as *Hygrorhizos deccanii* gen. et sp. nov. Further, from the same locality a fossil palm root has been collected. Besides, a number of slides of the petrified woods recovered from Pondicherry have been prepared. The preliminary studies revealed that these woods belong to Anacardiaceae, Combretaceae, Dipterocarpaceae, Ebenaceae and Leguminosae. Some leaf impressions collected from Ranibagh, 3 km north of Kathgodam, resembling *Terminalia* (Combretaceae), *Diospyros* (Ebenaceae), *Brutonia* (Hyrtaceae) and *Carisa* (Apocynaceae) have been identified.

Microfossils—Lignite samples recovered from Neyveli were macerated for cuticular studies. Some of the cuticles show resemblance with the culticles of the extant genera of Lauraceae, Combretaceae, Fagaceae, Lythraceae, Oleaceae and Asclepiadaceae. Besides, the cuticle resembling that of *Litsea* (Lauraceae) has been described. Palynological study of Neyveli lignite has also been taken up and interesting and well-preserved pteridophytic sporangia with intact spores belonging to family Polypodiaceae have been described. Fungal fruiting bodies resembling *Diploidia* and *Monilia*, and other fungi resembling Phycomycetes

and Ascomycetes have been described for the first time from this area. Studies of microfossils from Neyveli, Varkala and Quilon have been carried out and several new pollen and spores and fungal remains have been identified.

Rajiv Kumar Srivastava

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

The samples were collected from Loktak Lake area, Manipur. During the field survery it was found out that some subsurface profiles (about 4 m or more from the surface) were exposed.

Five profiles consisting of 135 samples were systematically collected which partially yielded fossil pollen grains, in some cases in good frquency and preservation. All the samples and organic sediment were macerated. The vegetational and floristic information were collected from literature and it was found out that there were 2192 species from over 213 families and 1012 genera ranging from pteridophytes to angiosperms It was also recorded that the forests in Manipur are sharply stratified by altitude. About 650 species of the dominant types in and around the Loktak Lake were made into a check list.

Pollen morphological studies of about 140 species both of dicotyledons and monocotyledons were carried out. The pollen grains show a great variety of morphological characters. A pollen key has been prepared based mainly on apertural characters and their distributional pattern, also considering other morphological features, e.g. the surface ornamentation, shape, size, etc. The study of the local pollen flora (of Loktak and adjacent areas) has been very helpful to identify the dispersed fossil pollen grains. More than 50 acetolysed samples from the organic sediments were scanned, grains identified and counted. Single grain preparations of individual fossil pollen types have been done from the investigated samples Photomicrography of each individual pollen morphotype has been done.

One of the profiles from Loktak Power Channel area has been studied in detail. A histogram and a composite pollen diagram has been constructed on the basis of distribution of spores and pollen grains. The diagram could not be divided into pollen zones, probably because climatic fluctuation during the time of deposition was not pronounced. The diagram gave a more or less homogeneous picture.

Most of the samples were dominated by grass and Cyperaceae pollen grains. The sporadic presence of the pollen grains of *Betula* and *Alnus* gave an interesting touch. The presence of different arboreal pollen types originated from Myrtaceae, Meliaceae, Mimosaceae, Fabaceae and cf. *Terminalia* which probably depict a tropical rain forest type during the time of deposition. This view could be supported by the presence of the pollen grains of *Justicia*, *Impatiens*, Lamiaceae, Asteraceae, Euphorbiaceae, etc. The presence of different fern spores show a good preservation and percentage. The results of the above studies were incorported in two papers which have almost been finalized.

Partha Roy

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

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

Seven different types of stomata have been recognised with in the family for the first time. It has been observed that ontogenetically the polocytic, copolocytic, pseudopolocytic, anomocytic and hemisparacytic type of stomata are mesoperigenous, while the paracytic and coparacytic types are mesogenous in origin. Further, the study reveals that the mesogenous stomata are derivative of the mesoperigenous form.

Taking stomata as the parameter, it has been observed that among the cyatheoids, *Thyrsopteris* and *Cystodium* are primitive, while *Dicksonia, Cyathea, Alsophila, Hemitelia, Cnemidaria* and *Culcita* are in active state of evolution. *Lophosoria, Metaxya* and *Cibotium*, though extremely derived, represent blind evolutionary lines.

The exine of the spores studied shows great variation not only in different groups but some times in the same genus.

Surajit Chakraborty

Thesis Submitted

Neerja Jha — "Palynology of the Lower Gondwana sediments in Godavari Valley".

Papers Published

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Field Work

1. Palynological samples from Krol and Tal formations exposed at Duggadah, Landsdown, Singtali, Satpuli and Mussorie areas of Lesser Himalaya were collected (P. K. Maithy, Manoj Shukla and Bijai Prasad).

2. Algal limestones were collected from Tiruchirapalli District, Tamil Nadu (Pramod Kumar and P. K. Misra).

3. Organo-sedimentary structures and palynological samples from Bhander and Rewa groups exposed in Chakghat-Rewa Section and around Rewa were collected (P. K. Pal and Bijai Prasad).

4. Palynological samples and stromatolites were collected from Aravalis, Vindhyan and Gwalior supergroups exposed around Sawai, Madhopur and Bundi, Rajasthan (P. K. Maithy, Bijai Prasad, Rupendra Babu and Kalyan Lal Meena).

5. The geological sequences of the Blaini-Krol-Tal succession exposed in Maldevata, Gopichand Ka Mahal, Singhtali, Kauriyala and Tal Valley in Blaini-Krol Tal were visited for detailed investigations (P. K. Maithy).

6. Plant megafossils were collected from Lalmatia Colliery and Paharpur abondoned Colliery of the Rajmahal Hills, Bihar (A. K. Srivastava and V. K. Singh).

7. Megafossils and samples for bulk maceration were collected from 12 different collieries of the Raniganj Coalfield. These samples and fossils belong to Raniganj and Barakar formations (H. K. Maheshwari, Usha Bajpai, Kamaljeet Singh Rajni Tewari and V. K. Singh).

8. Plant megafossils have been collected from various Triassic outcrops of the South Rewa Gondwana Basin (P. K.Pal).

9. Plant megafossils have been collected from various Athgarh Sandstone localities in Orissa (Sukh Dev, A. Rajnikanth and Neeru Pandya).

10. Leaf-impressions and petrified woods were collected from the Siwalik beds of Koilabas in Nepal and near Kalagarh in Uttar Pradesh and from the Tertiary beds on Kotwar-Doggadda Road. The sediments from Malani Swamp near Ram Nagar were also collected (Uttam Prakash, M. B. Bande and Mahesh Prasad).

11. A good collection of leaf-impressions and petrified woods was made from the Neogene beds of Bihar and various Cenozoic localities of West Bengal (M. B. Bande and G. P. Srivastava).

12. Leaf-impressions from the Palaeogene locality near Cherra-Punji and the Neogene beds near Siliguri were collected (Krishna Ambwani).

13. Aerial and ground survey of the Lok Tak Lake and the surrounding forests particularly in the catchment Area of the Lake in Imphal in Manipur State were undertaken (Vishnu-Mittre).

14. Bore-cores as well as out crop samples were collected from Rajmahal and Damodar basins (R. S. Tiwari, Archana Tripathi, Vijaya Singh and Ram Awatar).

15. Systematic sampling of the Gondwana sediments was done in Arunachal Pradesh and Darjeeling areas of West Bengal (Suresh C. Srivastava).

16. To study the Blaini, Krol-Tal succession Tal Valley, Maldevta and other related areas were visited (R. S. Tiwari).

17. A field excursion was undertaken to collect the palynological samples from Rajmahal and Damodar basins for bulk maceration (K. L. Meena).

18. An excursion was undertaken to study the different Tertiary formations in Kachchh. Samples from Rajpardi lignite mine, near Ankleshwar were also collected (R. K. Kar).

19. Bore core samples of Lakwa 22 were collected (R. K. Kar).

20. Palynological samples were collected along the National Highway 44 between 125-141 km in Meghalaya. Besides, samples were collected from the contact zones exposed along this road. (Anil Chandra, J. Mandal & G. K. Trivedi).

21. Field excursions to South Shillong Plateau, Meghalaya ; Cauvery Basin, southern India; Kachchh Basin and Surat, western India were undertaken to collect rock samples from measured Jurassic, Cretaceous and Tertiary sections, to work out dinoflagellate cysts and nannofossil biostratigraphy in the areas.

22. An excursion was undertaken to collect coal and carbonaceous shale samples from Darjeeling and Arunachal Pradesh for the biodiagenetic studies (Anand Prakash).

23. An excursion was undertaken to collect coal samples from the newly started Kakri Colliery. Besides, field work in Kachni Nala Section was also carried out (B. K. Misra and B. D. Singh).

24. An excursion was undertaken to collect the lignite samples from the Neyveli Lignite Field for the petrological studies (G. K. B. Navale, B. K. Misra and Alpana Agarwal).

25. Tertiary coal samples from Bapung, Sutunga and Jarain collieries in Khasi-Jaintia Hills, Meghalaya were collected (B. K. Misra).

26. An excursion was undertaken to collect the coal and associated sediments from Ramgarh and East Bokaro Coalfield for the palynopetrological studies (Rakesh Saxena).

27. A field trip was undertaken for collection of glauconite and granite samples from the Lower Vindhyan exposures in Banda District. Glauconite samples from Lodhwara, North and South hillocks, Sangrampur Hill and Janki Kund were also collected. Collophane deposited at Janki Kund was also collected to attempt F-T dating on another authigenic sedimentary mineral.

Papers Read at Symposia/Conferences/ Meetings, etc.

Archana Tripathi—Palynostratigraphy and dating of Indian Lower Gondwana sediments. International Symposium on Recent Advances in Quantitative Stratigraphic Correlation, Kharagpur.

Aruna Sharma—The early Holocene Barley in India. Fifth Indian Geophytological Conference, Lucknow.

A. K. Srivastava—A new genus from the Raniganj Coalfield, West Bengal. Fifth Indian Geophytological Conference, Lucknow.

B. K. Misra—Petrological and chemical characteristics of the eastern himalayan coals from Elephan Flat area, Kameng District, Arunachal Pradesh. Fourth Convention of the Indian Association of Sedimentologists, Aligarh Muslim University, Aligarh.

Bijai Prasad and P. K. Maithy—Microbiota from the Krol succession in Mussorie Syncline. Fifth Indian Geophytological Conference, Lucknow.

G. K. B. Navale—Lower Gondwana coals of India. International Gondwana coal symposium, Lisbon, Portugal.

G. K. B. Navale—Lower Gondwana coals, the role of V/I ratio in correlation and classifications of coals.

B. N. Jana and H. K. Maheshwari—*Crookshankites:* A new name for *Dettmannites* Singh & Kumar. Fifth Indian Geophytological Conference, Lucknow.

G. Rajagopalan, R. S. Tiwari, Suresh C. Srivastava, Archana Tripathi and Vijaya Singh—A computer program for storage and retrieval of palynological references. Fifth Indian Geophytological Conference, Lucknow.

G. Rajagopalan and A P. Srivastava—Fission track dating of some Precambrian deposits from Vindhyans. Fifth Indian Geophytological Conference, Lucknow.

G. Rajagopalan and A. P. Srivastava—Fission track dating of Lower Vindhyan sediments, Semri Group at Chitrakut, Banda District. Fourth Convention of the Indian Association of Sedimentologists, Aligarh Muslim University, Aligarh.

J. S. Guleria, V. C. Thakur, N. S. Virdi and R. N. Lakhanpal—Fossil wood of *Prunus* from Kargil (= Liyan) Formation, Ladakh. Fifth Geophytological Conference, Lucknow.

Krishna Ambwani—Observations on the anatomy of the stem of *Trachycarpus martiana* H. Wendl. Fifth Indian Geophytological Conference, Lucknow.

K. S. Saraswat—Plant economy in ancient Mahorana, Pd. IB (C. 2100-1900 B.C.) Fifth Indian Geophytological Conference, Lucknow.

K. S. Saraswat—Ancient plant economy at Rohira, Pd. IB (C. 2000-1700 B.C.). XV Session of Indian Archaeological Society, Pune.

Mahesh Prasad and Uttam Prakash—Leaf impressions from the Lower Siwalik beds of Koilabas, Nepal. Fifth Indian Geophytological Conference, Lucknow.

Manoj Shukla—Occurrence of microstromatolites and stromatoporoids from the Calc-Zone, Pithoragarh. Fifth Indian Geophytological Conference, Lucknow.

P. K. Maithy—Microbiota from the Lower Tal of Mussorie Syncline with critical remarks on the previous algal records. Workshop on Blaini-Krol-Tal Succession, Dehradun.

P. K. Maithy—Indian Precambrian biota—Their significance in evolution and biostratigraphy. Symposium on Precambrian and Lower Palaeozoic Biostratigraphy.

P. K. Maithy and Kalyan L. Meena—Microbiota from the Semri Group exposed around Chitrakut. Fifth Indian Geophytological Conference, Lucknow.

P. K. Misra and Pramod Kumar—Algal remains from Cretaceous of Varagur, Trichinopolly District, South India. Fifth Indian Geophytological Conference, Lucknow.

P. K. Pal and Jayasri Banerji—Megafloral succession in Peninsular India during Triassic time. Fifth Indian Geophytological Conference, Lucknow.

R. N. Lakhanpal—Aspects of Neogene Palaeobotany of the Himalayas: Presidential Address. Fifth Indian Geophytological Conference, Lucknow.

R. S. Tiwari, Archana Tripathi and Pramod Kumar—*Rajmahalispora*—A new cingulate spore genus from Triassic of Rajmahal Basin, India. Fifth Indian Geophytological Conference, Lucknow.

R. S. Tiwari, Pramod Kumar and Archana Tripathi—Palynodating of Dubrajpur and Intertrappean beds in subsurface strata of north-eastern Rajmahal Basin. Fifth Indian Geophytological Conference, Lucknow.

R. S. Tiwari and Vijaya Singh—Morphographic studies of some disaccate genera from Triassic of Raniganj Coalfield, India. Fifth Indian Geophytological Conference, Lucknow.

R. S. Tiwari, Vijaya Singh, S. Kumar and I. B. Singh—Palynological studies of the Tethyan sequence in Malla-Johar area, Kumaon Himalaya, India. Fifth Indian Geophytological Conference, Lucknow.

Ram Udar and Asha Gupta—A new species of *Riccia* from Deoban, western Himalayas. Fifth Indian Geophytological Conference, Lucknow.

Rupendra Babu and P. K. Maithy—Microbiota from the carbonaceous shales belonging to Arangi Formation, Chopan. Fifth Indian Geophytological Conference, Lucknow.

Sukh Dev and A. Rajnikanth—A taxacean wood from the Jurassic of Maharashtra. Fifth Indian Geophytological Conference, Lucknow.

Usha Bajpai and H. K. Maheshwari—Electron microscope investigation of the megaspore of *Isoetes coromandelina* L. Fifth Indian Geophytological Conference, Lucknow.

Usha Bajpai and V. K. Singh—*Araucarioxylon kumarpurensis*, a new species from the Upper Permian of West Bengal. Fifth Indian Geophytological Conference, Lucknow.

Vishnu-Mittre—Progress of ethnobiology work (AICRPE Project). The meeting of Man and Biosphere Committee, Department of Environment, New Delhi.

Vishnu-Mittre—When did the Quaternary Period begin? An overview of fresh information. Fifth Indian Geophytological Conference, Lucknow.

Vishnu-Mittre and A. Bhattacharyya—Vegetation and climate during the last Glaciation in Ladakh, western Himalaya. Fifth Indian Geophytological Conference, Lucknow.

Vishnu-Mittre and Aruna Sharma—The discovery of *Eleusine africana* Kennedy O' Bryne (*E. coracana* subsp. *africana* Phillips) in India and its biogeographical implication. Fifth Indian Geophytological Conference, Lucknow.

Vishnu-Mittre and Chanchala—The use in India of wild plant life in time and space and its biogeographical significance. Fifth Indian Geophytological Conference, Lucknow.

Vishnu-Mittre and M. S. Chauhan—Pollen analytical history of the Sal forests in M. P. Fifth Indian Geophytological Conference, Lucknow.

Vishnu-Mittre, D. C. Saini and N. K. Sharma—Observations on the ethnobiology and ethnography of wild plants in India. Fifth Indian Geophytological Conference, Lucknow.

Vishnu-Mittre and G. Rajagopalan—An appraisal of Quaternary history of South Asia through radiometric dates. Fifth Indian Geophytological Conference, Lucknow.

Vishnu-Mittre and S. K. Bera—Studies of pollen production and sedimentation within the Sal forests in Sidhi Forest Division, M. P. Fifth Indian Geophytological Conference, Lucknow.

Lectures given Outside the institute

G. Rajagopalan—Dating methods for ancient materials. Two lectures of UNESCO sponsored training course in conservation of cultural property.

G. K. B. Navale—Classification of Indian coals. Indian Institute of Tropical Research, Lisbon, Portugal.

G. K. B. Navale—Resinites/vitrinites of coals. Coal Research Centre, Oviedo, Spain.

G. K. B. Navale—Coals in India. National Coal Survey, Madrid, Spain.

G. K. B. Navale—Recent advances in Indian coal analysis. International Fuel Resources Assessment Laboratory, Frankfurt, Germany.

M. N. Bose—'Mesozoic sequence in India—A palaeobotanist's view', at the Department of Astronomy and Earth Sciences, Tokyo Gakugei University, Japan.

M. N. Bose—'Palaeobotany in India and what are fossils for? at the Nanjing Institute of Geology and Paleontology, Nanjing, China.

M. N. Bose—'Recent advances in Indian Mesozoic palaeobotany' at the Nanjing Institute of Geology and Paleontology, Nanjing, China.

M. N. Bose—'Mesozoic floras of India' at the Institum Botanicum, Academia Sinica, China.

M. N. Bose—First Mulk Raj Sahni Memorial Lecture entitled 'Recent advances in Mesozoic palaeobotany in India' at the Geology Department, University of Chandigarh, Chandigarh.

P. K. Maithy—Precambrian life and evolution. Bose Research Institute, Calcutta.

P. K. Pal—Life: Its concept, origin and early evolution. Jaynarayan Degree College, Lucknow.

R. N. Lakhanpal—The Siwalik flora: an overview. Dr J. Sen memorial lecture delivered at the Botany Department, Calcutta University, Calcutta.

Vishnu-Mitttre—Triannual lecture on "History of vegetation and climate in the tropics. Andhra University, Waltair.

Vishnu-Mittre—Environmental background to human cultures. Department of Anthropology, Andhra University, Waltair.

Vishnu-Mittre—The changing subsistence pattern. Department of Anthropology, Andhra University, Waltair.

Vishnu-Mittre—The need for study of forests. Botany Department, Andhra University, Waltair.

Training Provided to Outsiders

Shri C. A. Alat (Scientist, Regional Geology Laboratory, Oil and Natural Gas Commission, Sibsagar, Assam) was given training to study the leaf-impressions.

Km. Margaret B. McKean (Department of Anthropology, Souther Methodist University, Dallas, Texas, U.S.A.) was also imparted training in Quaternary Palaeobotany.

Km. Maqsuda Khan (Batany Department, Kashmir University, Srinagar) was given training to study the pollen/spores and in archaeobotany.

Shri P. K. Shukla (Botany Department, Government College of Science, Raipur, Madhya Pradesh) was given training to study the plant mega-and microfossils.

Shri O. P. Suthar (Botany Department, Jodhpur University, Jodhpur) was given training in palynological studies.

Shri Chandan Mukherjee (Geology Department, Calcutta University) was imparted training in biopetrological preparations and their study.

Dr M. Ahmed (Geology Department, Gauhati University) was given training in microphotometric methods.

Technical Assistance to Outsiders

Central Mining, Planning & Designing Institute, Ranchi

Results of the biopetrological and rank evaluation of 36 coal samples from Raniganj Coalfield, West Bengal were finalized in the form of a report which was sent to the C.M.P.D.I., Ranchi.

Biopetrological, rank and palynostratigraphical data on west Bokaro coals with particular reference to their utilization potentiality were finalized. Report has been sent to C.M.P.D.I.

Neyveli Lignite Corporation

Biopetrological and rank evaluation of Lignite samples from a bore-core of New Mine area, Neyveli Lignite Field have been completed. Report has been sent to N.L.C., Neyveli, South India.

Geological Survey of India

A report dealing with the palynological investigation of the lignite samples from bore-core NLE-35 and 36 was finalized and sent to G.S.I. camp at Neyveli, Tamil Nadu.

Geological Survey of India

Bore-core samples from the Rajmahal and Godavari basins have been dated palynologically. Besides, the carbon dating of eight sediment and two charcoal samples was also done.

Archaeological Survey of India

The archaeobotanical materials sent by them were investigated. Besides, carbon dating of nine charcoal samples from Gufkral (Kashmir) was done.

University of Paris, France

The investigation of pollen analytical samples collected from Nepal was continued.

Punjab University, Chandigarh

Archaeobotanical materials sent by the Department of Ancient Indian History and Archaeology were investigated. The results of the studies have been communicated.

Carbon dating of two charcoal samples from the site Mahorana, District Sangrur was also done.

Deccan College, Pune

Radiocarbon dating of two mud plaster samples from the excavation site—Inamgaon was done.

Five samples (three of wood, one of shell and one peat) were dated by C^{14} method for the geomorphological studies.

Directorate of Cultural Affairs and Archaeology, Punjab

C14 dating of three charcoal samples from the site Rohira, Sangrur District was done.

Society for Environmental Archaeology, Lucknow

Two sediment samples collected from the site Dadupur were dated by C14 method.

Irrigation Projects and Water Resources Investigation Circle, Pune

One wood sample from the proposed dam-site at Pakani in Sholapur District was dated by C14 method

National Geophysical Research Institute, Hyderabad

One wood sample collected from East Garo Hills, Meghalaya was dated by C14 method for the seismological studies of the area.

Centre for Earth Science Studies, Trivandrum

Carbon dating of two wood and peat samples recovered from Quilon District was done.

Deputation/Training/Study Abroad

G.K.B. Navale

He visited Portugal, Spain and West Germany on special invitations from: (*i*) The Institute of Investigation, Scientific and Tropical Research to attend the International Gondwana Coal Symposium in Lisbon, Portugal, (*ii*) Fuel Research Institute, Oviedo, Spain to participate in the International Coal Nomenclature and Classification Committees, and (*iii*) International Carboniferous Congress, Madrid, Spain to participate in Global correlation of coals for coding Coal and Mineral Analysis for a Germany Company. Dr Navale was also invited to give a talk on the Indian coal analytical data.

M.N. Bose

He visited the Nanjing Institute of Geology and Paleontology from 3rd to 18th September, 1983 at an special invitation of the Academia Sinica. Then under the exchange programme of the Indian National Science Academy and Japan Society for the Promotion of Science Dr Bose visited Japan from 19th September to 1st October, 1983.

Amalava Bhattacharyya

He was deputed for two years to have the training in Dendrochronology and Dendroclimatology in the Graduate College, University of Arizona, Tucson, U.S.A.

Publication and Information Section

Publication

During the year under review numbers 1, 2 and 3 of volume 31 of The Palaeobotanist were printed. Besides, the manuscripts of all the three issues of next volume 32 were also processed and sent to press for publication. The blocks of these issues and Volume 33 too, were also supplied to the printer.

The 11th Birbal Sahni Memorial Lecture titled "Status and position of hornworts" by Dr R. S. Chopra was printed. Besides, the manuscript of 13th Birbal Sahni Memorial Lecture entitled "Plants, animals and time" delivered by Prof. W. G. Cialoner, University of London, U. K. was processed and sent to press for printing.

The 30th Sir Albert Charles Seward Memorial Lecture entitled "Palynology, organic petrology and petroleum—A palaeobotanist's view" was also published.

Both Hindi and English versions of the Annual Report for the year 1982-83 were compiled and published. The printed copies were also sent to various universities, libraries, institutions and colleges.

During the period under review an income of Rs. 62,384.02 was registered from the sales proceeds of the Institute publications. This sum includes the following foreign exchange earnings.

US $ = 2,990.05

£ = 363.45

Library

Stock:

No.	Details	Position on 31.3.1983	Additions during 1983-1984	Total
1.	Books	3748	114	3862
2.	Journals	7644	163	7807
3.	Reprints	28373	841	29214
4.	Microfilm/fiche	268	21	289
5.	Theses	39	5	44
6.	Reports	45	—	45
7.	Maps and Atlases	45	1	46
8.	Reference Books	151	3	154

In addition to above, 86 current periodicals were also subscribed in the Library.

During the year under review the total number of registered borrowers has gone up to 132.

Exchange Programme:

(*i*) Number of papers whose reprints were purchased for exchange 45

(*ii*) Total number of reprints sent out on exchange 3800

(*iii*) Number of institutions on exchange .. 57

(*iv*) Number of individuals on exchange .. 416

(*v*) Set of papers of Professor Birbal Sahni sent .. 9

(*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. Besides, a list of reports available in our Library was prepared to assist the reader in quick searching of the desired literature, etc.

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: Geological Survey of India, Lucknow; Wadia Institute of Himalayan Geology, Dehradun; Govt. Post Graduate College of Science, Raipur; University of Burdwan; Burdwan; Banaras Hindu University, Varaansi Gorakhpur University, Gorakhpur; Allahabad University, Allahabad; University of West Indies, Jamaica; Lucknow University, Lucknow; Indian School of Mines, Dhanbad; National Botanical Research Institute, Lucknow; Industrial Toxicological Research Centre, Lucknow; and Bangalore University, Bangalore.

Museum

A number of fossil specimens and slides were sent to various colleges and university departments under a special programme "Palaeobotany for Education". New labels of all the specimens displayed in the Museum Hall were printed. Besides, the gift of fossil specimens were sent to various Institutions in China, Japan and Korea, which are particularly engaged in the palaeobotonical research.

Fossil Store

The sorting of specimens and keeping them in polythene bags have been completed. New locality registers incorporating the locality data and the details about the collections have been maintained.

Type & Figured Specimens/Slides/Negatives

This year Museum statements of 73 research papers were made. The position of Type and Figured specimens as on 31st March, 1984 was as under:

Type & Figured specimens	—	2729
Type & Figured slides	—	8468
Negatives of the above	—	8506

New Collection from India

The scientific staff of the Institute collected a number of samples/specimens from about 227 localities. The department-wise details of the collections are as under:—

	Samples	*Specimens*
1. Department of Non-Vascular plants	1347	110
2. Department of Palaeophytic Evolutionary Botany	25	1280
3. Department of Mesophytic Evolutionary Botany	26	1614
4. Department of Cenophytic Evolutionary Botany	36	3719
5. Department of Quaternary Biogeography and Archaeo-botany	227	--

6.	Department of Pre-Gondwana Palynostratigraphy	1986	—
7.	Department of Post-Gondwana Palynostratigraphy of Peninsular India	585	—
8.	Department of Post-Gondwana Palynostratigraphy of Extra-Peninsular India	—	—
9.	Department of Planktonology	138	—
10.	Department of Biodiagenesis	304	—
11.	Department of Radiometric Dating	45	—

New collection from abroad

1.	British Museum of Natural History, London	4 specimens
2.	Nanking Institute of Geology and Palaeoecology, Academia Sinica, Nanking, China	8 specimens
3.	Department of Astronomy & Earth Sciences, Gokugei University Kognel, Tokyo, Japan	6 specimens
4.	Department of Geology & Mineralogy, Faculty of Science, Kyoto University, Kyoto, Japan	42 specimens

Fossil specimens sent abroad

1. Professor Munes, Ege Universitesi Fen Fakultesi, Biyology Bolumu, Baranova-Ismir, Turkey.

2. Professor Sumio Yamazaki, Department of Mineral Industry, School of Science & Engineering, Waseda University, Shinjuku-Ku Okubo 169, Tokyo, Japan.

3. Professor W. G. Chaloner, Bedford College, University of London, London.

4. Director, International Tropical Research Institute, Lisbon, Portugal.

Specimens/samples received for investigation

1.	Wadia Institute of Himalayan Geology, Dehradun	856 samples
2.	Geological Survey of India, Northern region, Lucknow	271 samples
3.	Geology Department, Banaras Hindu University, Varanasi	30 samples
4.	Geologist, Kolar Goldmines, Karnataka	1 sample

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

1. Head, Department of Botany,
P. N. B. Gujarati Vigyan Mahavidyalaya,
Indore, M.P.

2. Botany Department,
Science College,
Raipur, M.P.

3. Botany Department,
Darjeeling Government College,
Darjeeling, W.B.

4. Principal,
Maharaja College,
Chhatarpur, M.P.

5. Principal,
Adhikari Saraladas College,
Tirtol, Cuttack,
Orissa.

6. Botany Department,
M. G. Degree College,
Gorakhpur, U.P.

7. Department of Biology,
Guru Nanak Dev University,
Amritsar, Punjab.

8. Principal,
Giridih College,
Giridih,
Bihar.

9. Botany Department,
Narain College,
Shikohabad, U.P.

10. Botany Department,
S. M. M. Town Post Graduate College,
Ballia, U.P.

11. Principal,
St. Johns College,
Agra, U.P.

12. Botany Department,
Godda College,
Godda, Santhal Pargana,
Bihar.

13. Principal,
City College,
Calcutta, West Bengal

Visitors during the year

During the period under report about 400 visitors visited the Institute's Museum. Nationals of England, Denmark, USSR, Malayasia, Japan, United States of America, Germany and delegates of the V Indian Geophytological Conference were among the important visitors.

The students alongwith teachers of the following institutions also paid a visit to our Museum.

1. Punjab University, Chandigarh.
2. D. S. College, Karnal, Haryana.
3. Kalyani University, Kalyani, West Bengal.
4. Govt. College of Arts and Science, Aurangabad, Maharashtra.
5. St. Xavier College, Ranchi, Bihar.
6. Bhopal University, Bhagalpur, Bihar.
7. Cotton College, Gauhati, Assam.
8. Gorakhpur University, Gorakhpur, U.P.
9. Garhwal University, Srinagar, U.P.
10. Maharaja College, Arrah, Bihar.
11. Ranchi College, Ranchi, Bihar.

Herbarium

Following additions have been made during this year.

Specimens	Addition during the year	Total as on 31.3.1984
Herbarium sheets	10	11,621
Fruits & Seeds	6	1,863
Wood specimens	27	3,477
Wood slides	80	3,939
Pollen slides	25	10,594
Palm slides (Stem, root, petiole, leaf)	—	3,195

The routine work of label writing, indexing, poisoning and restitching of plant specimens, issue/return of the herbarium material was done. The shifting of the herbarium almirahs from Museum Hall to Herbarium Gallery was started. Sorting and re-arranging the plant specimens from old collections were undertaken. About 100 plant specimens, bearing fruits or flowers, from the Indo-Japanese collection were mounted.

For smooth working in issue and return the xylarium collection was systematically rearranged in cardboard boxes.

Poisoning of fruits and seeds present in the herbarium was completed.

About 85 wood slides prepared at the Institute by the scientists were registered and incorporated in the old collection. Display of herbarium material in the Gallery was started. Coloured transparencies and black and white transparencies, showing the anatomical features of *Mesua* and *Ginkgo* have also been exhibited. Classification charts, display charts, preparation of India and world map depicting the important national herbaria and the localities showing the collection of herbarium material from different parts of the world have been completed. More than 1000 duplicate plant specimens were sorted out for exchange purposes.

Facilities

Research workers of the Botany Department, Lucknow University consulted our Xylarium and Herbarium. They were issued small blocks of wood specimens under the condition that they would submit a set of duplicate slides of each specimen to our Herbarium.

Following research workers of various organizations/institutions consulted the Herbarium for their research work.

1. Dr R. C. Srivastava,
   Systematic Botanist,
   Botanical Survey of India,
   Central Circle,
   Allahabad

3. Dr M. S. Ansari,
   Director,
   Pharmacopocial Laboratory for Indian Medicine,
   Ghaziabad

3. Dr A. A. Ansari,
   Systematic Botanist,
   Botanical Survey of India,
   Southern Circle,
   Coimbatore

Material received from:

Officer-in-charge,
Wood Anatomy Branch, — 4 wood specimens
Forest Research Institute,
Dehradun.

Forestry commission of New South Wales
Bee Croft, — 23 wood blocks
Australia.

Material sent to:

Officer-in-charge — 8 wood slides
Wood Anatomy Branch,
Forest Research Institute,
Dehradun

Distinguished Visitors

1. Margaret Mekav, Dallas, Texas, U.S.A.

2. Dr Judnn Coruus, Kathmandu, Nepal.

3. Dr S. M. Casshyap, Geology Department, A. M. U., Aligarh.
4. Dr G. Bhattacharya, N. R. S. Medical College, Calcutta.
5. Dr Partha S. Das, N. R. S. Medical College, Calcutta.
6. Mr M. N. Qureshi, Scientist NISTD (CSIR).
7. Dr R. M. Mineeva, I. G. E. M. Sciences, USSR.
8. Dr A. K. Sinha, Wadia Institute of Himalayan Geology, Dehradun.
9. Mr George (Rip) Rappa, University of Minnesota, U.S.A.
10. Dr Schisho Tobinoga, Prof. of Organic Chemistry, Jhawa College of Pharmaceutical Sciences, Tokyo, Japan.
11. Prof. T. R. Sharma, P. G. Department of Geology, University of Jammu, Jammu.
12. Dr A. K. Kar, Residency College, Calcutta.
13. Mr Sene-eg-arne Vejbeck, Denmark.
14. Professor W. G. Chaloner, Bedford College, University of London, U.K.
15. Mr M. M. Imam, National University of Malayasia & Oil Palm Research Institute of Malayasia, Kuala-lumpur.
16. Dr G. D. Liversuge, National Museum, Denmark.
17. F. J. Cob, University of Halle.
18. David M. Wallace, Baylor University Waco, Texas, U.S.A.
19. Dy. Counsellor for Scientific & Technical Corporation, French Embassy in India, New Delhi.

20. Walter N. Lemine, Biology Department, Washington University, St. Louis, U.S.A.

Founder's Day Celebrations

The Birthday of Professor Birbal, Sahni, F.R.S. was celebrated on 14th November, 1983. In the morning at 9.00 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 persons. Besides, in the evening the "*Samadhi*" was decorated by flowers and garlands.

On the same day at 3.00 p.m. the 13th Birbal Sahni Memorial Lecture entitled 'Plants, animals and time' was delivered by Prof. W. G. Chaloner, F. R. S., Bedford College, University of London, U.K.

Garden

The lawns were maintained throughout the year by mowing, cleaning and watering whenever felt necessary. The hedges around the "Samadhi" of Professor Birbal Sahni were also cut and pruned regularly. *Bougainvillea* around the fence was also properly maintained and pruned. About 50 plants of *Chrysanthemum* were donated to the garden by Dr M. N. Bose. Some of the rose plants in the "Samadhi" were replaced by new ones. Besides, the rose plants were also transplanted in front of the new auditorium. The *Cana* beds were watered and manured, the old ones were replaced. On 14th November, 1983 and 10th April, 1984 the 'Samadhi' and the campus were decorated.

The Staff

(as on 1.4.1983)

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.)
Sri Bijai Prasad, M.Sc. (S.S.A.)
Sri Rupendra Babu, M.Sc. (J.S.A.)
Sri Kalyan Lal Meena, M.Sc. (J.S.A.)
Sri P. K. Misra, M.Sc. (J.S.A.)

Department of Palaeophytic Evolutionary Botany

Dr H. K. Maheshwari, M.Sc., Ph.D., F.P.S. (A.D.)
Dr (Smt.) Shaila Chandra, M.Sc., Ph.D., F.L.S. (S.S.O.)
Dr A. K. Srivastava, M.Sc., Ph.D. (J.S.O.)
Dr (Smt.) Usha Bajpai, M.Sc., Ph.D. (S.S.A.)
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 (Kumuri) Jayasri Banerji, M.Sc., Ph.D. (S.S.O.)
Sri Pankaj Kumar Pal, M.Sc. (S.S.A.)
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. (S.S.O.)
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 (Smt.) Madhu Panjwani, M.Sc., Ph.D. (S.S.A.)
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), (A.D.)
Dr H. P. Gupta, M.Sc., Ph.D. (S.S.O.)
Dr (Smt.) Chhaya Sharma, M.Sc., Ph.D. (S.S.O.)
Dr K. S. Saraswat, M.Sc., Ph.D. (S.S.O.)
Sri A. Bhattacharya, M.Sc. (S.S.A.)
Sri R. R. Yadav, M.Sc. (S.S.A.)
Dr (Smt.) Asha Khandelwal, M.Sc., Ph.D. (S.S.A.)
Kumari Aruna Sharma, M.Sc. (S.S.A.)
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 Suresh C. Srivastava, M.Sc., Ph.D. (J.S.O.)
Dr (Smt.) Archana Tripathi, M.Sc., Ph.D. (S.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.)
Sri R. S. Singh, M.Sc. (S.S.A.)

Sri Madhava 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.)
Sri S. K. M. Tripathi, M.Sc. (S.S.A.)
Sri M. R. Rao, M.Sc. (S.S.A.)
Sri Samir Sarkar, M.Sc. (S.S.A.)
Dr (Kumari) Asha Gupta, M.Sc., Ph D. (J.S.A.)
Sri A. P. Bhattacharya, M.Sc. (J.S.A).

Department of Planktonology

Dr K. P. Jain, M.Sc., Ph.D. (A.D.)
Dr S. A. Jafar, M.Sc., Ph.D. (S.S.O.)
Sri Rahul Garg, M.Sc. (S.S.A.)
Sri K. Ateequazamman, M.Sc. (J.S.A.)
Sri Rajesh Kumar 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.)
Sri B. K. Misra, M.Sc. (S.S.A.)
Sri Rakesh Saxena, M.Sc. (S.S.A.)
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.)

D.S.T. Sponsored Project—Ethnobiology

Dr D. C. Saini, M.Sc., Ph.D. (Research Associate)

Publication & Information Section

Publication

Sri Jaswant Singh, M.Sc. (Joint Editor)
Sri S. B. Verma, M.A., B.Com,, D.P.A. (Publications Incharge)

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. (Curator)
Sri J. C. Srivastava, M.Sc. (Herbarium Incharge)
Sri Diwakar Pradhan, B.Sc. (Herbarium Assistant)
Sri A. K. Singh Rathore, B.Sc., B.Lib.Sc. (Herbasium Assistant)

Laboratory Services

Sri H. N. Boral, B.Sc. (S.T.A.)
Sri B. Sekar, B.Sc., A.I.C. (S.T.A.)
Smt. Asha Guleria, B.Sc. (J.T.A.)
Smt. Madhabi Chakraborty, B.Sc. (J.T.A.)
Smt. Indra Goel, B.Sc. (J.T.A.)
Sri D. C. Joshi, B.Sc. (J.T.A.)
Kumari. Kamla Amarlal, B.Sc. (J.T.A.)
Sri N. K. Khasnavis, B.Sc., LL.B. (J.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. (J.L.A.)
Kumari Reeta Ghatterji, B.Sc. (J.L.A.)

Sri Keshav Ram (J.L.A.)
Sri Chandra Pal, B.Sc. (J.L.A.)

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)

Photography & Drawing

Sri P. C. Roy (Photographer)
Sri P. K. Bajpai (Artist)

Stores

Sri Harjeet Singh, B.A. (Store Keeper)
Smt. Omana Pillai (Stenotypist)

Accounts Section

Sri Ghanshyam Singh, B.Com. (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.)

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. (Office 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 (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.)
Smt. Lalitha Nair (L.D.C.)
Sri Hari Lal (L.D.C.)

Driver

Sri Hanuman Prasad
Sri Lallan
Sri Balbir Singh

General Help

Sri Bhim Singh (Mechanic-cum-Section Cutter)
Sri Raja Ram (Attendant)
Sri Sarju Prasad (Daftari)
Sri Sia Ram (Duplicating Machine Operator)
Sri Roop Chand (Attendant)
Sri Satruhan (Attendant)
Sri Sunder Lal (Attendant)
Sri Bashir (Attendant)
Sri Prem Chandra (Attendant)
Sri Ram Singh (Peon)
Sri Rajendra Kumar (Peon)
Sri K. C. Chandola (Peon)
Sri Sri Ram (Peon)
Sri Haradhan Mahanti (Peon)
Sri Bam Singh (Peon)
Sri Kedar Nath (Peon)
Sri Lalta Prasad (Peon)
Sri Prem Shanker (Chowkidar)
Sri Ram Dhari (Chowkidar)
Sri Ram Deen (Chowkidar)
Sri Vishnu-Kumar (Chowkidar)

Sri Kesho Ram (Chowkidar)
Sri Bishnu Dutt (Chowkidar)
Sri Ram Sahai (Mali-Skilled)
Sri Bipat (Mali-Skilled)
Sri Chaitu (Mali-Skilled)
Sri Rameshwar Prasad Pal (Mali-unskilled)
Sri Chhanga Lal (Safaiwala)
Sri Nanhoo (Safaiwala)
Sri Mewa Lal (Safaiwala)
Sri Ram Kishan (Safaiwala)
Smt. Munni (Safaiwali)
Smt. Maya Devi (Safaiwali)

Appointments & Promotions

Department of Non-vascular Plants

Dr Bijai Prasad, S.S.A., promoted as Junior Scientific Officer w.e.f. 27th March, 1984.

Department of Palaeophytic Evolutionary Botany

Dr (Smt.) Shaila Chandra, S.S.O., promoted as Assistant Director w.e.f. 1st November, 1983.

Dr (Smt.) Usha Bajpai, S.S.A., promoted as Junior Scientific Officer w.e.f. 27th March, 1984.

Department of Mesophytic Evolutionary Botany

Dr P. K. Pal, S.S.A., promoted as Junior Scientific Officer w.e.f. 27th March, 1984.

Department of Cenophytic Evolutionary Botany

Dr N. Awasthi, S.S.O., promoted as Assistant Director w.e.f. 1st November, 1983.

Department of Quaternary Biogeography & Archaeobotany

Dr Vishnu-Mittre, Assistant Director, promoted as Deputy Director w.e.f. 1st November, 1983.

Dr H. P. Gupta, S.S.O., promoted as Assistant Director w.e.f. 1st November, 1983.

Dr R. R. Yadav, S.S.A., promoted as Junior Scientific Officer w.e.f. 27th March, 1983.

Dr (Smt.) Asha Khandelwal, S.S.A., promoted as Junior Scientific Officer w.e.f. 27th March, 1984.

Kumari Aruna Sharma, S.S.A., promoted as Junior Scientific Officer w.e.f. 27th March, 1984.

Department of Pre-Gondwana and Gondwana Palynostratigraphy

Smt. Neerja Jha, S.S.A., promoted as Junior Scientific Officer w.e.f. 27th March, 1984.

Department of Post-Gondwana Palynostratigraphy of Peninsular India

Sri R. S. Singh, S.S.A., promoted as Junior Scientific Officer w.e.f. 27th March, 1984.

Department of Post-Gondwana Palynostratigraphy of Extra-Peninsular India

Dr M. R. Rao, S.S.A., promoted as Junior Scientific Officer w.e.f. 27th March, 1984.

Dr Samir Sarkar, S.S.A., promoted as Junior Scientific Officer w.e.f. 27th March, 1984.

Department of Biodiagenesis

Dr Rakesh Saxena, S.S.A., promoted as Junior Scientific Officer w.e.f. 27th March, 1984.

Library

Sri G. K. Gupta, Library Assistant, promoted to next higher grade w.e.f. 27th December, 1983.

Kumari Kavita Sangal, Library Assistant, promoted to next higher grade w.e.f. 27th December, 1983.

Museum

Sri N. C. Saxena, Museum Assistant, promoted as Museum Assistant w.e.f. 27th December, 1983.

Herbarium

Dr H. A. Khan, Curator, promoted as Senior Scientific Officer w.e.f. 16th November, 1983.

Sri Diwakar Pradhan, Herbarium Asstt., promnted as Herbarium Incharge w.e.f. 27th December, 1983.

Sri A. K. S. Rathore, Herbarium Assistant, promoted as Herbarium Incharge w.e.f. 27th December, 1983.

Laboratory Services

Sri H. N. Boral, Senior Technical Assistant, promoted as Junior Technical Officer w.e.f. 27th March, 1984.

Smt. Asha Guleria, Junior Technical Assistant, promoted as Senior Technical Assistant. w.e.f. 27th December, 1983.

Smt. Indra Goel, Junior Technical Assistant, promoted as Senior Technical Assistant w.e.f. 27th December, 1983.

Smt. Madhabi Chakraborty, Junior Technical Assistant, promoted as Senior Technical Assistant w.e.f. 27th December, 1983.

Kumari Kamla Amarlal, Junior Technical Assistant, promoted as Senior Technical Assistant w.e.f. 27th December, 1983.

Kumari Rita Chatterjee, Junior Lab Assistant, promoted as Lab. Assistant w.e.f. 24th January, 1984.

Sri A. K. Srivastava, Junior Lab Assistant, promoted as Lab. Assistant w.e.f 24th January, 1984.

Sri V. P. Singh appointed as Junior Laboratory Asstt. w.e.f. 26.4.83 and then promoted as Lab. Assistant w.e.f. 24th January, 1984.

Sri R. C. Misra appointed as Junior Laboratory Asstt. w.e.f. 23.4.83 and then promoted as Lab. Assistant w.e.f. 24th December, 1984.

Other Technical Services

Sri V. S. Panwar, Glass Blower, was given next higher grade w.e.f. 27th December, 1983.

Photography & Drawing

Sri P. C. Roy, Photographer, was given the next higher grade w.e f. 27th December, 1983.

Sri P. K. Bajpai, Artist, was given the next higher grade w.e.f. 27th December, 1983.

Sri Pradeep Mohan was appointed as Dark Room Assistant w.e.f. 22th April, 1983.

Stores

Sri N. K. Khasnavis, Junior Technical Assistant, appointed as Deputy Registrar w.e.f. 1st November, 1983.

Accounts

Sri S. B. Verma, Publications Incharge, was appointed as Accounts Officer w.e.f. 5th January, 1984.

Sri Sanjay Kumar was appointed as Lower Division Clerk w.e.f. 16th August, 1983 (A.N.)

Administration

Sri Kosy Thomas was appointed as Lower Division Clerk w.e.f. 18th August, 1983.

General Help

Sri Bhim Singh, Mechanic-cum-Section Cutter, was promoted to next higher grade w.e.f. 27th December, 1983.

Sri Mahipal Singh, Mechanic, was promoted to next higher grade w.e.f. 27th December, 1983.

Sri Chhotey Lal was appointed as Mechanic-cum-Section Cutter.

Sponsored Projects

D. S. T.—Ethnobiology Project

Sri N. K. Sharma was appointed as Junior Research Fellow w.e.f. 6th July, 1983.

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

Sri Chandra Pal, Junior Lab. Assistant, was appointed as Junior Technical Assistant w.e.f. 8th December, 1982.

O. I. D. Board Projects (Two)

Sri E. G. Khare, J.T.A., appointed as Senior Technical Assistant w.e.f. 17th January, 1984.

Kumari Geeta Saxena was appointed as Senior Technical Assistant w.e.f. 19th January, 1984.

Kumari Madhuri Shukla was appointed as Junior Technical Assistant w.e.f. 18th January, 1984.

Sri Keshav Ram, J.L.A., was appointed as Junior Technical Assistant w.e.f. 23rd January, 1984.

Shrimati Nijhum Pal was appointed as Junior Technical Assistant w.e.f. 15th February, 1984.

Sri Krishnanand was appointed as Junior Laboratory Assistant w.e.f. 23rd January, 1984.

Shrimati Madhulika Verma was appointed as Junior Laboratory Assistant w.e.f. 25th January, 1984.

Retirement

Shri Ghanshyam Singh, Accounts Officer, retired on 31st December, 1983.

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 Dehli 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 Arun Kumar
Architect,
Halwasia Court, Hazratganj,
Lucknow 226 001

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

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

Research Advisory Council

Professor A. K. Ghosh,
Botany Department,
Calcutta University,
Calcutta

Dr Sunirmal Chanda,
Bose Institute,
Calcutta

Professor F. Ahmad, F.N.A.,
4-D/D, Ext. Gandhi Nagar,
Jammu (J&K)

Professor D. D. Pant, F.N.A.,
106, Tagore Town,
Allahabad

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 G. Thanikaimoni,
French Institute,
Pondixherry

Dr D. C. Bharadwaj,
Mahanagar,
Lucknow

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

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

Dr R. N. Lakhanpal, F.N.A.,
Distinguished Scientist,
Birbal Sahni Institute of Palaeobotany,
Lucknow

Building and Garden Committee (as on 1.4.1983)

Dr R. K. Kar
Dr A. K. Srivastava
Dr Manoj Shukla
Sri S. D. Mehtani

Dark Room Committee (as on 1.4.1983)

Dr R. S. Tiwari
Dr (Kumari) Jayasri Banerji
Dr (Smt.) Archana Tripathi

Herbarium Committee (as on 1.4.1983)

Dr N. Awasthi
Dr H. P. Gupta
Dr Pramod Kumar
Dr H. A. Khan

Incharge Vehicles and Guest House Maintenance (as on 1.4.83)

Dr Anand Prakash

Maintenance Committee (as on 1.4.1983)

Dr K. P. Jain, Convener
Dr Shyam C. Srivattava
Dr K. Ambwani
Sri S. B. Verma

Museum Committee (as on 1.4.1983)

Dr P. K. Maithy, Convener
Dr H. K. Maheshwari
Dr R. S. Tiwari
Dr N. Awasthi
Dr Anil Chandra
Shri G. P. Srivastava

Procurement and Quality Control Committee (as on 1.4.1983)

Dr G. K. B. Navale
Dr Anand Prakash
Dr (Smt.) Shaila Chandra
Shri Ghanshyam Singh
Shri S. B. Verma

Publication & Information Committee (as on 1.4.1983)

Dr H. K. Maheshwari, Convener
Dr R. S. Tiwari
Dr Suresh C. Srivastava
Dr M. B. Bande
Dr Chhaya Sharma
Shri J. S. Antal

Canteen Committee (as on 1.4.1983)

Dr Sukh Dev, Chairman
Dr Anand Prakash
Shri N. K. Khasnavis
Shri S. K. Suri
Shri Bhagwan Singh
Smt. Indra Goel
Kumari Kamla Amarlal

COMPLIANCE OF THE AUDIT REPORT OF THE BSIP FOR THE YEAR ENDING ON 31ST MARCH, 1984

1. Needs no comment.

2. As per standard practice, no depreciation is charged on the fixed assets and their original cost is reflected in the Balance Sheet.

3. Needs no comment.

4. The classification work has already been taken up by our Architect and is in progress. The Architect has been requested to expedite it.

5. The bulk of unsettled advances comprises the amounts advanced for foreign journals for our Library. The advance is treated as settled only on the receipt of full set of journals and that is the main reason for delay in settlement of such advances. Efforts are, however, already being made to settle such advances expeditiously.

AUDITORS REPORT
OF
BIRBAL SAHNI INSTITUTE OF PALAEOBOTANY, LUCKNOW

We have audited the annexed Balance Sheet of Birbal Sahni Institute of Palaeobotany, Lucknow as at 31st March, 1984 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, 1984 and the Income and Expenditure Account gives a true and fair view of excess 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, 1984

1. Account of the Institute is maintained on cash basis.

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

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

Books and Journals	Rs. 8,711.04	
Maps and Toposheets	Rs. 79.95	Rs. 8,790.99
Total		Rs. 8,790.99

4. In absence of classified details of completed building works, the sum of Rs. 19,64,825.09 have been shown 'as Building Works under construction', efforts should be made to classify the capitalisation under the various works.

5. Immediate efforts should be made to settle outstanding advances of the Library in Capital Account.

For R. N. KHANNA & COMPANY
Chartered Accountant

(Sd. R. N. KHANNA)
Partner

Place: Lucknow
Date: 16th July, 1984

Statement of Accounts for the year 1983-84

Birbal Sahni Institute

Balance Sheet as on

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.	AMOUNT Rs.
Capital Fund:			
Balance as per Last Year's Balance Sheet		1,09,00,208.28	
Add: Govt. of India Grants on Capital Account ..		25,00,000.00	
Miscellaneous Receipt ..		1,789.60	
Insurance claim for equipment lost in transit containing Polishing Machine	29,607.25		
Less: Value of equipment	25,000.00	4,607.25	
Recurring Expenditure used for creating Fixed Assets :			
Books & Journals	8,711.04		
Maps & Toposheets	79.95	8,790.99	1,34,15,396.12
Advance Fund for Employees :			
As per last year's Balance Sheet ..	4,61,177.00		

of Palaeobotany, Lucknow

31st March, 1984

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Fixed Assets:		
Land (Donated by Govt. of U. P.) ..		32,292.00
Works & Building :		
(i) **Building :**		
As per Last Year's Balance Sheet	17,26,652.04	
(ii) **Building Works Under Construction :**		
As per Last Year's Balance Sheet	9,25,836.18	
Additions during the year:		
Out of Capital Account..	10,38,988.91	36,91,477.13
Out of Revenue Account..	—	
Research Apparatus and Equipments :		
As per Last Year's Balance Sheet ..	21,26,002.54	
Additions during the year ..	15,70,632.42	36,96,634.96
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	

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.	AMOUNT Rs.
Advance during the Year ..	69,002.00		
	5,30,179.00		
House Building Advance to Mrs. Guleria	100.00	5,30,279.00	
Less: Recovery during the year		82,814.00	4,47,465.00
Excess of Income over Expenditure:		6,45,229.77	
Add: Transfer from Advance Fund ..		13,812.00	6,59,041.77
Donated Funds/Grants:			
Cost of Land donated by U. P. Govt.		32,292.00	
Founder's Donation		1,52,500.00	
C. D. Pant Memorial Fund		2,276.88	
C. L. Katiyal Memorial Fund		3,961.08	
Total C/o ..			1,45,21,902.89

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Additions during the year ..	—	1,34,798.06
Establishment of C-14 Radio-metric Lab. :		
As per Last Year's Balance Sheet ..	23,08,791.19	
Additions during the year ..	2,51,423.83	25,60,215.02
Plant and Machinery :		
As per Last Year's Balance Sheet ..	5,97,694.43	
Additions during the year ..	46,920.69	6,44,615.12
Apparatus and Equipment (Donated) :		
M. G. T. Scheme (C.S.I.R.) ..	7,155.79	
Burmah Oil Co. ..	700.00	
Founder's Donation ..	2,500.00	
Coal Scheme (C.S.I.R) ..	6,645.29	
Palynological Scheme (C.S.I.R.)	5,207.87	
Rajasthan Scheme (sponsored by Univ. of Wisconsin) ..	21,138.90	
UNESCO Aid Equipment ..	19,629.75	
Humboldt Foundation (W. Germany) ..	75,091.50	1,38,069.10

LIABILITIES	AMOUNT Rs.	AMOUNT Rs	AMOUNT Rs.
P. C. Bhandari Memorial Fund		3,448.05	
A. C. Seward Memorial Fund		12,283.58	
Other Misc. Donations		11,371.29	
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 Univ. of Wisconsin)		23,009.15	
Gift in Kind :			
Humboldt Foundation (W. Germany)		75,000.00	
P. K. Srivastava Mem. Fund		3,130.00	
Birbal Sahni Research Award Endowment		21,400.00	3,83,795.10

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Vehicles :		
As per Last Year's Balance Sheet		2,88,685.07
Furniture and Fixtures :		
As per Last Year's Balance Sheet ..	8,30,977.22	
Additions during the year ..	1,66,554.01	9,97,531.23
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 Univ. of Wisconsin) ..	979.70	4,264.07
Books and Journals :		
As per Last Year's Balance Sheet ..	4,11,047.06	
Additions during the year :		
Out of Revenue Account ..	8,711.04	4,19,758.10
Founder's Library (Donated)		50,000.00
Founder's Fossil Collection (Donated) :		50,000.00
Maps and Topo Sheets :		
As per Last Year's Balance Sheet ..	13,062.05	

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.	AMOUNT Rs.
General Provident Fund/Contributory Provident Fund ..			19,83,817.54
Current Liabilities and Provisions :			
Security and Earnest Money Deposits			1,12,142.00
Total C/o :			1,70,01,657.53

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Additions during the year ..	79.95	13,142.00
Investment (Donated Account) :		52,000.00
Investment (Bank Guarantee) :		
For A. C. C. Unit		13,000.00
UNESCO Book Coupons :		793.02
Cash and Bank Balances :		
Cash in Hand (Imprest Account) ..	444.50	
Current Account with State Bank of India ..	10,11,066.26	10,11,510.76
Loans and Advances :		
Unsettled Advances—Plan Revenue Account ..	22,678.00	
Unsettled Advances—Plan Capital Account ..	6,49,915.50	
Unsettled Advances—Non-Plan Revenue Account ..	23,411.00	
Unsettled Advances—ONGC Project ..	8,210.00	7,04,214.50

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.	AMOUNT Rs.
Total B/F ..			1,70,01,657.53
			1,70,01,657.53
Grand Total ..			1,70,01,657.53

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

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Advances to Employees :		
House Building Advance ..	3,84,817.00	
Festival Advance ..	12,760.00	
Conveyance Advance ..	49,888.00	4,47,465.00
General Provident Fund/ Contributory Provident Fund :		
Investments ..	14,50,000.00	
Advances out of G. P. F. ..	1,31,902.00	
Insurance out of G. P. F.	19,207.00	
With State Bank of India ..	3,82,708.54	19,83,817.54
Grand Total ..		1,70,01,657.53

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 for the

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Academic Expenses:			
To pay & Allowances of Academic Staff ..	5,15,285.80	14,14,589.24	19,29,875.04
To field excursion ..	56,031.51	14,977.02	71,008.53
To Remuneration of Birbal Sahni Professor ..	—	—	—
To Sponsoring & Participation in Conferences & Symposia etc. ..	7,865.45	—	7,865.45
To Honorarium to Lecturers:			
For Birbal Sahni Mem. Lecture ..	—	500.00	500.00
For Silver Jubilee Mem. Lecture ..	—	—	—
To International Programme:			
Deputation Abroad..	—	48,789.20	48,789.20
Honorarium for Visiting Scientist ..	—	—	—

of Palaeobotany, Lucknow

Year ending 31st March, 1984

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Balance of last year's Grant of Revenue Account allowed for Expenditure during Current Year ..	50,990.04	1,54,272.22	2,05,262.26
By Grant from Govt. of India on Revenue Account ..	12,00,000.00	36,50,000.00	48,50,00,000
By Grants from U.P. Govt. on Revenue Account ..	—	10,000.00	10,000.00
By Sale Proceeds of Priced Publications:			
"The Palaeobotanist" ..	—	61,224.62	61,224.62
Monographs ..	—	100.00	100.00
Symposium & Spl. Publication ..	—	547.20	547.20
Seward Memorial Lecture ..	—	109.00	109.00
Birbal Sahni Mem. Lecture ..	—	41.00	41.00
Silver Jubilee Mem. Lecture ..	—	26.00	26.00

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Expenses of services Ancillary to Research:			
To pay & Allowance of Auxi. Technical Staff ..	1,18,638.47	5,03,849.77	6,22,488 24
To Chemicals & Glasswares, photo-goods & Small Apparatus, etc. ..	49,574.76	2,23,214.50	2,72,789.26
To Library Requirements ..	—	24,353.11	24,353.11
To Museum Requirements ..	675.00	7,109.20	7,784.20
To Maintenance of Apparatus and Equipment & Workshop Machinery ..	23,189.29	—	23,189.29
To Publication Expenses:			
"The Palaeobotanist" ..	—	71,595.01	71,595.01
Birbal Sahni Memorial Lecture ..	—	—	—
Annual Report ..	—	11,260.50	11.260.50
Seward Memorial Lecture ..	—	—	—
Silver Jubilee Lecture ..	—	—	—

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Picture Post Cards ..	—	445.25	445.25
Catalogue of Indian Fossil Plants ..	—	261.20	261.20
Aspects & Appraisal of Indian Palaeobotany ..	—	75.00	75.00
IVth I.P.C. Proceedings ..	—	—	—
By Miscellaneous Receipts and Recoveries:			
Vehicle Charges ..	—	19.50	19.50
By Telephone Charges ..	—	1,270.80	1,270.80
By V. S. Room Charges ..	—	255.00	255.00
By Application Fees	—	1,001.00	1,001.00
Miscellaneous Receipts and Recoveries ..	6,606.32	6,438.23	13,044.55
Int. on Conveyance Advance ..	—	4,238.08	4,238.08
Pension Contribution ..	—	—	—
Interest on House Building Advance ..	—	—	—

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Publication of I.P.C. proceedings ..	—	—	—
Travelling & other Allowances:			
For Governing Body, Scientific Programme & Evaluation Committee and Selection Committee Meetings	—	3,735.45	3,735.45
For Attending Scientific Meetings & Conferences in India and for other purposes ..	11,783.78	37,302.10	49,085.88
For Reimbursement of Medical Expenses	7,711.44	18,636.63	26,348.07
For over time allowance ..	385.75	2,768.78	3,154.53
For Leave Travel Concession ..	1,289.00	8,889.17	10,178.00
For Reimbursement of Tution Fees ..	339.25	348.75	688.17
For Children Edu. allowance ..	—	—	—
Funds for Training of Staff in India ..	—	570.00	570.00

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Employees Insurance Scheme ..	359.00	1,326.50	1,685.50
Deposit Account ..	—	—	—
Interest on Savings Bank Account ..	—	49,597.42	49,597.42
O.N.G.C. Project:			
Opening Balance ..	—	11,225.77	11,225.77
Grant ..	—	23,868.61	23,868.61
Misc. Receipts/ Refunds ..	—	111.20	111.20
Festival Advance of July, 1983 to be transferred to BSIP A/c. ..	—	20.00	20.00
Oil Industry Development Board:			
Grant ..	—	35,000.00	35,000.00
U.G.C. :			
Grant ..	—	5,580.65	5,580.65
All India Coordinated Research Project on Ethnobiology:			
Opening Balance ..	—	4,893.87	4,893.87
Grant ..	—	20,000.00	20,000.00
Total C/o	12,57,955.36	40,41,948.12	52,99,903.48

EXPENDITURE	PLAN Rs.	NON-PLAN Rs	TOTAL Rs.
To Pensionary Expenses:			
To Superanuation Allowance & Pension ..	—	1,50,428.20	1,50,428.20
Payment under Insurance Sch. ..	5,026.00	27,850.00	32,876.00
G. P. F. Interest ..	—	98,824.80	98,824.80
G. P. F. Contribution ..	—	2,136,00	2,136.00
To General Expenses:			
To Pay & Allowance of Administrative Staff ..	1,22,104.24	5,62,995.34	6,85,099.58
To Telephone & Trunk Call Charges	—	30,801.90	30,801.90
To Postage ..	—	25,359.10	25,359.10
To Advertisement Charges ..	3,921.20	34,927.20	38,848.40
To Hot & Cold weather Ch. ..	1,000.00	5,461.18	6,461.18
To Petrol & Mobil Oil ..	1,924.85	6,635.77	8,560.62
To Electricity Charges ..	19,411.15	22,547.56	41,958.71
To Municipal Taxes	—	—	—

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	12,57,955.36	40,41,948.12	52,99,903.48
Total C/o	12,57,955.36	40,41,948.12	52,99,903.48

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Insurance of Vehicle & Library ..	—	5,282.00	5,282.00
To Uniform to Class IV Staff ..	2,000.00	11,364.79	13,364.79
To Printing & Stationery ..	9,929.32	54,208.36	64,137.68
To Custom Duty & Port Trust Ch. ..	—	—	—
To Railway Ft. & Carriage ..	—	2,649.92	2,649.92
To Entertainment Allowance to Director ..	—	2,319.63	2,319.63
To Miscellaneous & Unforeseen ..	20,067.97	49,205.19	69,273.16
To Maintenance Expenses:			
To Building ..	—	13,345.80	13,345.80
To Garden ..	—	4,910.20	4,910.20
To Vehicle ..	9,504.50	6,213.83	15,718.33
To Repairs & Renewals ..	18,235.64	19,977.35	38,212.99
To Other Expenses:			
To Deposits refunded ..	—	—	—
To Medical Advice ..	—	48.00	48.00

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	12,57,955.36	40,41,948.12	52,99,903.48
Total C/o	12,57,955.36	40,41,948.12	52,99,903.48

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Audit Fees ..	—	2,000.00	2,000.00
To Legal Advice ..	—	2,230.00	2,230.00
To Welfare Expenses:			
Financial Assistance to Departmental Canteen ..	—	4,782.00	4,782.00
Birbal Sahni Research Scholarship ..	—	37,700.00	37,700.00
Birbal Sahni Research Contingency ..	—	10,800.44	10,800.44
O. N. G. C. Project:			
To Pay & Allowances ..	—	13,870.62	13,870.62
Chemical & Glasswares ..	—	4,543.50	4,543.50
Miscellaneous ..	—	5,954.50	5,954.50
Oil Industry Development Board:			
To Pay & Allowances ..	—	11,188.73	11,188.73
Chemicals & Glasswares ..	—	3,106.77	3,106.77
T.A. ..	—	497.50	497.50
Miscellaneous ..	—	640.85	640.85

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
	12,57,955.36	40,41,948.12	52,99,903.48
Total C/o	12,57,955.36	40,41,948.12	52,99,903.48

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
U.G.C. :			
Honorarium to Shri D. N. Pant ..	—	3,580.65	3,580.65
All India Coordinated Research Project on Ethnobiology ..	—	17,903.23	17,903.23
Excess of Income over Expenditure ..	2,52,060.99	3,93,168.78	6,45,229.77
Grand Total:	12,57,955.36	40,41,948.12	52,99,903.48

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.
	12,57,955.36	40,41,948.12	52,99,903.48
Grand Total	12,57,955.36	40,41,948.12	52,99,903.48

(Sd. S. B. Verma)
Accounts Officer
Birbal Sahni Institute
of Palaeobotany,
Lucknow

(Sd. M. N. Bose)
Director
Birbal Sahni Institute
of Palaeobotany,
Lucknow

(Sd. Gurcharan Singh)
Registrar
Birbal Sahni Institute
of Palaeobotany,
Lucknow.

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	—	1,53,911.67	1,53,911.67
Plan Revenue Account	50,990.04	—	50,990.04
Plan Capital Account	12,50,669.12	—	12,50,669.12
Donation Account	—	2,820.88	2,820.88
Cash Account:			
Non-Plan Revenue Account	—	360.55	360.55
To Govt. of India Grants on Capital Account:	25,00,000.00	—	25,00,000.00
To Govt. of India Grants on Revenue Account:	12,00,000.00	36,50,000.00	48,50,000.00
To Covt. of U. P. Grant on Recurring Account:	—	10,000.00	10,000.00
To Sale Proceeds of Publication:			
The Palaeobotanist	—	61,224.62	61,224.62
Monograph	—	100.00	100.00

of Palaeobotany, Lucknow

Period 1.4.1983 to 31.3.1984"

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Capital Account:			
By Works & Building	10,34,371.49	—	10,34,371.49
By Research Apparatus & Equipments	16,86,210.52	—	16,86,210.52
By Equipt. for Services Ancillary to Research:			
Library	79,993.90	—	79,993.90
Photography	48,131.75	—	48,131.75
C-14 Laboratory	2,82,010.23	—	2,82,010.23
Plant & Machinery	1,22,464.19	—	1,22,464.19
By Furniture & Fixture:	1,80,116.78	—	1,80,116.78
By Pay and Allowances:			
Pay (Academic)	2,14,327.33	6,77,305.96	8,91,633.29
Pay (Technical)	40,292.44	1,96,012.58	2,36,305.02
Pay (Administrative)	46,071.07	2,14,886.88	2,60,957.95
D.A. & Addl. D.A.	3,34,195.50	10,54,525.33	13,88,720.83
House Rent Allowance	62,330.54	1,75,641.40	2,37,971.94

RECEIPTS	PLAN Rs.	NON-PLAN Rs	TOTAL Rs
Symposium	—	547.20	547.20
Catalogue	—	261.20	261.20
Aspects & Appraisal of Indian Palaeo-botany	—	75.00	75.00
Seward Memorial Lecture	—	109.00	109.00
Birbal Sahni Mem. Lecture	—	41.00	41.00
Picture Post Cards	—	445.25	445.25
Silver Jubilee Mem. Lecture	—	26.00	26 00
To Administrative Receipts:			
Income Tax	3,040.00	59,390.00	62.430.00
Insurance Premium (S.S.Sch.)	4,009.35	45,729.52	49,738.87
C.T.D. Post Office	1,310.00	5,550.00	6,860.00
G.P.F. Subscription	54,856.13	2,80,536.06	3,35,392.19
Recovery of G.P.F. Advance	16,067.00	99,978.00	1,16,045.00
Recovery of B.S.I.P. Credit Co-operative Society	10,715.80	45,998.65	56,714.45

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
City Comp. Allowance	18,252.03	53,774.23	72,026.26
Interim Relief	25,379.85	74,941.42	1,00,321.27
Over Time Allowance	385.75	2,768.78	3,154.53
Medical Reimbursement	7,711.44	18,636.63	26,348.07
Reimb. of Tuition Fees	339.25	348.75	688.00
Leave Travel Concession	1,289.00	10,199.17	11,488.17
Efficiency Bonus	600.00	1,731.05	2,331.05
Bonus	14,579.75	32,615.50	47,195.25
By Travelling Allowance:			
Governing Body & Selection Committee Meeting	—	3,735.45	3,735.45
For Attending Meeting & Conference in India	—	4,792.40	4,792.40
Funds for training of staff in India	—	570.00	570.00
For other purposes	11,783.78	37,009.70	48,793.48

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Misc. Receipts & Recoveries:			
Application Fees	—	1,001.00	1,001.00
V. S. Room Rent	—	255.00	255.00
Telephone Charges	—	1,270.80	1,270.80
Vehicle Charges	—	19.50	19.50
Other Misc. Receipts	6,606.32	6,438.23	13,044.55
C.D.S. from R.P.F. Commis., Kanpur	—	198.30	198.30
To Recoveries of Loans and Advances:			
Recovery of Festival Advance	—	20,200.00	20,200.00
Recovery of Conveyance Advance	—	29,464.00	29,464.00
Interest on Conveyance Advance	—	4,238.08	4,238.08
Recovery of House Building Advance	—	33,150.00	33,150.00
To Deposits:			
Employees Insurance Scheme	359.00	1,326.50	1,685.50
Security Deposits	1,11,530.00	—	1,11,530.00
To Donation and Endowments:			
Proceeds of Interest	—	5,200.00	5,200.00

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
By Maintenance of Property:			
For Building	—	13,680.80	13,680.80
For Garden	—	4,910.20	4,910.20
For Equipment & Apparatus	23,189.29	—	23,189.29
For Vehicles	9,504.50	6,213.83	15,718.33
For repairs, Renewals & Petty construction	18,235.64	19,977.35	38,212.99
By Contingencies:			
By Telephone & Trunk Call Charges	—	30,801.90	30,801.90
For Postage	—	25,359.10	25,359.10
For Advertisement	3,921.20	34,927.20	38,848.40
For Hot & Cold Weather Charges	1,000.00	5,461.18	6,461.18
For Petrol & Mobil Oil	1,924.85	6,635.77	8,560.62
For Electricity Charges	19,411.15	22,547.56	41,958.71
For Insurance of Vehicle & Library	—	5,282.00	5,282.00
For Liveries to staff	2,000.00	11,364.79	13,364.79

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Misc. Receipts on Capital Account:			
Interest earned in Savings Bank A/c.	—	49,597.42	49,597.42
Misc. Receipt on Capital Account	1,789.60	—	1,789.60
Ins. Claim of Polishing Machine	29,607.25	—	29,607.25
O.N.G.C. Project:			
Opening Balance	—	11,225.77	11,225.77
Grant	—	23,868.61	23,868.61
Misc. Receipts/ Refunds	—	111.20	111.20
Amount to be transferred to C.R. Account (Festival Advance) July, 83	—	20.00	20.00
Oil Industry Development Board:			
Grant	—	35,000.00	35,000.00
U.G.C.			
Encyclopaedic Dictionary of Palaeobotany	—	5,580.65	5,580.65

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
For Printing & Stationery	9,929.32	54,208.36	64,137.68
For Railway Ft. & Carriage	—	2,649.92	2,649.92
For entertainment Allowance to Director	—	2,319.63	2,319.63
For Misc. & Unforeseen	20,067.97	49,305.19	69,373.16
For Chemical & Glasswares	49,574.76	2,23,214.50	2,72,789.26
For Library Requirements	—	24,353.11	24,353.11
For Museum Requirements	675.00	7,109.20	7,784.20
For Legal Advice	—	2,230.00	2,230.00
For Medical Advice	—	48.00	48.00
For Audit Fees	—	2,000.00	2,000.00
For Publications:			
The Palaeobotanist	—	71,595.01	71,595.01
For Annual Report	—	11,260.50	11,260.50
For Birbal Sahni Mem. Lecture	—	500.00	500.00
For Academic Expenses:			
For Field Excursion	78,709.51	32,143.02	1,10,852.53

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
All India Coordinated Research Project Ethnobiology:			
Opening Balance	—	4,893.87	4,893.87
Grant	—	20,000.00	20,000.00
Total C/o	52,41,549.61	46,70,163.53	99,11,713.14

PAYMENT	PLAN Rs.	NON PLAN Rs.	TOTAL Rs.
Birbal Sahni Mem. Lecture	—	—	—
For Sir A.C. Seward Mem. Lecture out of Donation A/c.	—	1,650.00	1,650.00
Symposium & Seminar co-sponsored & participation	7,865.45	—	7,865.45
By International Programmes:			
Air passage for members of staff proceeding on Foreign Fellowship or invited to attend Scientific Meeting & Conference abroad (Deputation abroad)	—	48,789.20	48,789.20
Honorarium for Visiting Scientist	—	—	—
By Welfare Expenses:			
Financial Assistance to Departmental Canteen	—	4,782.00	4,782.00
By G.P.F. Account:			
G.P.F. subscription transferred to G.P.F. A/c.	54,856.13	2,80,536.06	3,35,392.19

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	52,41,549.61	46,70,163.53	99,11,713.14
Grand Total	52,41,549.61	46,70,163.53	99,11,713.14

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Recovery of Advance transferred to G.P.F. Account	16,067.00	99,978.00	1,16,045.00
G.P.F. Interest	—	98,824.80	98,824.80
Institute contribution to C.P.F.	—	2,136.00	2,136.00
By Miscellaneous:			
Income Tax Remitted	3,040.00	59,390.00	62,430.00
Insurance premium remitted (S.S. Scheme)	4,009.35	45,729.52	49,738.87
C.T.D. Amount remitted (Post Office)	1,310.00	5,550.00	6,860.00
B S.I.P. Co-operative credit society	10,715.80	45,998.65	56,714.45
C.D.S. from R.P.F. Com. Kanpur	—	198.30	198.30
B.S. Research Scholarship	—	37,700.00	37,700.00
B.S. Research Sch. contingency	—	10,800.44	10,800.44
By Loans and Advances:			
Festival Advance	—	20,600.00	20,600.00
Conveyance Advance	—	1,300.00	1,300.00

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	52,41,549.61	46,70,163.53	99,11,713.14
Total C/o	52,41,549.61	46,70,163.53	99,11,713.14

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
House Building Advance	—	47,102.00	47,102.00
Security Money refunded to Contractor	46,900.00	—	46,900.00
By Investments:			
Funds under Donation & Endowment Invested	—	—	—
Funds invested in Bank for Plant and machinery (A/c. plant)	13,000.00	—	13,000.00
By Pension & Superannuation:			
Pension, Family Pension & Gratuity, etc.	—	1,50,428.20	1,50,428.20
Payment under Insurance Scheme	5,026.00	27,850.00	32,876.00
O.N.G.C. Project:			
Pay of Staff	—	5,137.90	5,137.90
D.A. & Addl. D.A.	—	6,400.90	6,400.90
H.R.A.	—	1,099.89	1,099.89
C.C.A.	—	330.00	330.00

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	52,41,549.61	46,70,163.53	99,11,713.14
Total C/o	52,41,549.61	46,70,163.53	99,11,713.14

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Interim Relief	—	539.03	539.03
Bonus	—	362.90	362.90
Chemical & Glass-wares	—	4,543.50	4,543.50
Misc. & Unforeseen	—	14,164.50	14,164.50
Oil Industry Development Board:			
Pay of Staff	—	3,608.71	3,608.71
D.A. & A.D.A.	—	6,066.40	6,066.40
H.R.A.	—	786.11	786.11
C.C.A.	—	235.83	235.83
Interim Relief	—	491.68	491.68
Chemical & Glass-wares	—	3,106.77	3,106.77
T.A.	—	497.50	497.50
Miscellaneous	—	640.85	640.85
U.G.C.	—	3,580.65	3,580.65
All India Coordinated Research Project on Ethnobiology	—	17,903.23	17,903.23
Total C/o	52,41,549.51	46,70,163.53	99.11,713.14

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
	52,41,549.61	46,70,163.53	99.11,713.14
Total	52,41,549.61	46,70,163.53	99,11,713.14

BALANCE

	Bank	Cash	Total
Plan:			
Central Recurring			
In Cash Book	1,29,382.99	—	1,29,382.99
In S.B. Account	1,00,000.00	—	1,00,000.00
C. Non-Recurring			
In S.B. Account	4,00,397.11	—	4,00,397.11
Non Plan:			
Central Recurring	3,43,711.53	444.50	3,44,156.03
Donation & Endowment	6,370.88	—	6,370.88
Projects:			
Ethnobiology	6,990.64	—	6,990.64
U.G.C.	2,000.00	—	2,000.00
O.N.G.C.	2,646.96	—	2,646.96
O.I.D.B.	19,566.15	—	19,566.15
Grand Total	10,11,066.26	444.50	10,11,510.76

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
	46,11,769.51	42,88,432.87	89,00,202.38
Grand Total	46,11.769.51	42,88,432.87	89,00,202.38

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

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