ANNUAL REPORT
1982-83

BIRBAL SAHNI
INSTITUTE OF PALAEOBOTANY
LUCKNOW

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CONTENTS

Introduction

The Institute is devoted to the promotion of higher study and research in the varied aspects of Palaeobotany. The advanced palaeobotanical knowledge, so obtained, is also disseminated all over the world. The research activities at the Institute are carried out under various projects in the following 11 departments:

1. Department of Non-vascular Plants
2. Department of Palaeophytic Evolutionary Botany
3. Department of Mesophytic 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

Some of the outstanding achievements made during the year are as under:

A new type of possible seed-bearing fertile organ and a new ginkgoalean type of leaf have been reported from the Handappa

beds. On the basis of lithology and a fossil assemblage, a new formation, i. e. Pachwara Formation, has been recognised. The Barakar assemblage revealed the dominance of *Glossopteris* with narrow mesh forms, while the Pachwara Formation is characterised by the open mesh forms of *Glossopteris* and diversified petridophytes. A new species each of *Sphenobaiera* and *Yabiella* have been described from the Tiki Formation. A Podocarpaceous wood has been recorded for the first time from the Deccan Intertrappean beds of Malabar Hills, which shows that this family was present during the early Tertiary period in the Indian subcontinent. Plant raised from the seeds of *Eleusine coracana* subsp. *africana* discovered for the first time from India has been found to be tetraploid. The prominent occurrence of the genus *Densipollenites* in the Madhuban area sediments revealed a relatively earlier deterioration of climate during late Permian in the Peninsular India. The study of Arabian Sea surface sediments indicated that the recovered fungal fruiting bodies were the common parasites on the tropical forests along the Western Coast of India. Palynological studies of the Tertiary sediments of Lower Assam suggested that a warm and humid climate prevailed during the Palaeocene-Eocene time. The nannoflora and the sedimentological parameters of a middle Eocene Section in Kachchh area revealed extremely high hydrocarbon potential. Seven palynozones have been recognised in the West Bokaro Coalfield. The dating of glauconite samples by fission track method has been found useful in dating the sedimentary deposits of widely different ages. Peat and carbonaceous samples pertaining to neotectonic movement along the outer Himalayan thrust/fault planes have been dated to 20,660 $\pm$ 450 yrs, 28,100 $\pm$ 1,850 yrs. and 40,000 yrs.

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Research

Department of Non-Vascular Plants

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

Objective : *To study biota and organo-sedimentary structures from Precambrian rocks and their significance in stratigraphy*

Biota comprising Chitinozoa, scolecodonts, algae (Cyanophyceae) and Cryptarchs from the Vindhyans exposed around Dala-Chopan has been recorded. Chitinozoa and scolecodonts are recorded for the first time. The Chitinozoa are *Desmochitina, Sphaerochitina* and *Rhabdochaetinia*. The algal remains are: *Huronispora, Palaeoanacystis, Myxococcoides, Sphaerophycus, Corymbococcus, Gloeocapsomorpha, Oscillatoriopsis, Siphonophycus, Palaeolyngbya, Eomycetopsis, Gunflintia, Palaeoscytonema* and *Ghoshia*. The cryptarchs are: *Protosphaeridium, Lophosphaeridium, Orygmatosphaeridium, Kildinella, Granomarginata, Nucellosphaeridium, Pulvinomorpha* and *Pterospermosimorpha*. A critical assessment of the assemblage shows diversification of biota from the older to younger horizons. The older horizons are dominated by Chroococcacean algae and non-ornamented cryptarchs.

Sections of Stromatolites belonging to *Conophyton* and *Baicalica* have been cut in different plains to reconstruct their three dimensional views.

P. K. Maithy and Rupendra Babu

Observations on *Fermoria* Chapman from Rampura, Suket Shale Formation, Madhya Pradesh have been completed. About 100 compressions of *Fermoria* were isolated from rocks. The study reveals that the Indian *Fermoria* is identical to *Chuaria* Walcott.

P. K. Maithy and Manoj Shukla

The algal remains, viz., *Huronispora*, *Corymbococcus* and *Kakabekia* from the stromatolite-*Stratifera* belonging to Marwar Supergroup, Rajasthan have been recorded.

P. K. Maithy

The microstromatolites, viz., *Epiphyton*, *Renalcis* and *Sajania* and stromatomoporoid and body fossils from Calc-zone, Pithoragarh have been reported. Sections of stromatolites were also prepared. The stromatolites *Colonella*, *Baicalica*, *Inzaria* and *Stratifera* have also been described.

Manoj Shukla

Project : *Non-vascular plants from Post Pre-Gondwana rocks*

Objective : *To Study morphology of the non-vascular plants, their trends of evolution and stratigraphical significance*

A cyanophycean alga *Palaeowestiellopsis karharbarensis* gen. et sp. nov., belonging to Stigonemataceae, has been described from the Karharbari Formation (Permian) in the Giridih Coalfield, Bihar. It was found preserved on the stem of *Phyllotheca indica* Bunbury.

P. K. Maithy and P. K. Misra

Cyanophycean remains from the Deccan Intetrappeans, Mohgaonkalan, Madhya Pradesh have been reported. They are *Huronispora* cf. *microreticulata*, *Microcystiopsis mohgaonkalensis* gen. et sp. nov., *Palaeohydrococcus raoi* gen. et sp. nov. and *Neophormidium indicum* gen. et sp. nov. and belong to the families Chroococcaceae, Hyellaceae and Oscillatoriaceae respectively.

P. K. Misra and P. K. Maithy

Species of *Inapertisporites*, *Colligenites*, *Fusiformisporites Diporicellaesporites*, *Spegazzinites* and *Involutisporites* and *Dicellaesporites* have been described from the Tertiary of Kerala Coast.

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. Routine photography and line sketches of 44 nearly complete leaves have shown the presence of two new species of the genus. Some other genera identified in the collection are: *Schizoneura*, *Lelstotheca*, *Raniganjia*, *Trizygia*, *Santhalea*, *Dichotomopteris*, *Neomariopteris*, *Pantopteris*, *Pseudoctenis* and *Pteronilssonia*.

Kamaljeet Singh and Shaila Chandra

A new type of possible seed-bearing fertile organ has been investigated from Handappa. The main axis of the fructification is dichotomously branched, each branch bearing mostly alternate lateral branches. The lateral branches further dischotomise and ultimate branches bear seeds singly. A paper has been submitted for publication.

A new ginkgoalean type of leaf has been found in the Handappa beds. Final plate, reconstruction and text-figure have been completed.

Shaila Chandra

Observations and descriptions of leaf morphography and epidermal structure of five species of the genus *Glossopteris* collected from Churulia area of the Raniganj Coalfield have been completed. In all the species the stomata are sunken and generally irregularly distributed. Subsidiary cells are papillate.

Equisetalean remains belonging to the genera *Schizoneura*, *Phyllotheca* and *Lelstotheca* are being investigated for their finer cuticular features.

A. K. Srivastava

Anatomical investigation of a number of limonitic fossil woods collected from the Kumarpur Sandstone exposed by the Nonia Nala near Asansol has been undertaken.

Usha Bajpai and V. K. Singh

Observations on the fossil flora (mega- and microfossils) from the Lower Gondwana formations in the Pachwara Coalfield, Rajmahal Hills, Bihar have been completed. On the basis of lithology and fossil assemblage a new formation 'Pachwara Formation' has been recognised. The result of study shows that the Barakar assemblage is characterised by the dominance of *Glossopteris* with narrow mesh forms.

The Barakar Formation shows three successive miospore assemblages, i.e. (1) *Potonieisporites*, *Parastriapollenites* and *Scheuringipollenites*, (2) *Scheuringipollenites*, *Faunipollenites* and *Ibisporites*, (3) *Faunipollenites*, *Scheuringipollenites* and *Densipollenites*.

The Pachwara Formation is characterised by open mesh forms of *Glossopteris* and diversified pteridophytes. Miospore assemblage is characterised by dominance of *Densipollenites*, *Scheuringipollenites*, *Faunipollenites* *Striatopodocarpites* and common presence of triletes. From Dubrajpur Formation *Glossopteris*, *Neomariopteris*, *Platyphyllum* and Phyllotheca have been recorded.

Bijai Prasad and P. K. Maithy

Study of plant megafossils, seeds and megaspores collected from the Lalmatia group of quarries in Hura Tract, Khatangi Hill, Gopicander and Saldaha Nala Section, etc. Rajmahal Hills, Bihar was started. Most of the leaves belong to *Glossopteris* sp.

cf. *G. communis* Feistmantel. A few fern remains have also been identified. Seeds and megaspores are badly preserved.

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

A paper on the 'Application of Scanning Electron Microscope in the study of Indian Gondwana plants' was submitted for publication. The utility of the SEM has been demonstrated by investigating different types of fossils, e.g. wood, cuticle and megaspores. An improved technique for investigating fossil wood has also been presented.

Usha Bajpai and H. K. Maheshwari

A new type of megaspore has been isolated from the Kumarpur Sandstone Member of the Raniganj Formation exposed by the Nonia Nala near Asansol, West Bengal. After photographing the dried megaspores under incident light, some of these were differentially macerated in nitric acid and potassium hydroxide for inner structure. A mesosporium has not been found so far. Now the megaspores are being investigated both under the Scanning and the Transmission Electron Microscopes. For cutting ultrathin sections, the megaspores were passed through aqueous potassium permagnate, aqueous uranyl acetate, alcohol dehydration series, acetone and acetone + plastic. The megaspores were finally embedded in Spurr's low viscosity medium. Sections were cut with a glass knife. Due to hardness of the megaspore scleroderm, it has, so far, not been possible to cut sections less than 1 μm in thickness.

H. K. Maheshwari and Usha Bajpai

Four limonitic fossil woods from the Raniganj Formation of the Raniganj Coalfield are being investigated. Thin ground sections and acetate paper peels are being investigated by the light microscope, whereas fractured and acid-etched surfaces are being studied for fine topography of tracheidal pits under the SEM.

Usha Bajpai and H. K. Maheshwari

A monographic study of the fossil flora of the Lower Gondwana in the Raniganj Coalfield has been started.

H. K. Maheshwari, A. K. Srivastava and Usha Bajpai

Investigation of megaspores from the Karharbari Formation of Johilla, Hutar, Mohpani, Giridih, Daltonganj, Jainti and Umaria coalfields has been undertaken. After maceration of samples, a large number of megaspores were obtained. These were subjected to routine methods of study. Preliminary descriptions and photographs have been prepared.

Rajni Tewari and H. K. Maheshwari

Department of Mesophytic Evolutionary Botany

Project : *Middle-Upper Triassic floras of India*

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

A paper on "New leaf compressions from the Triassic of Nidpur, India" has been finalized, in which two new leaf genera *Marhwaseaphyllum* and *Rewaphyllum* have been instituted. The genus *Marhwaseaphyllum* is a pinnate hypostomatic leaf with characteristic stomatal apparatus and epidermal feature, whereas *Rewaphyllum* is a bipinnate amphistomatic leaf. The genus *Rewaphyllum* also includes *R. argentinicum* sp. nov. which was earlier described by Archangelsky (1968) as *Dicroidium* sp. from the Triassic of Argentina. In addition, a new combination *R.* (*Odontopteris*) *dubae* (Burgess, 1935) has also been suggested for the Australian species, which also includes cf. *O. dubae* from Argentina (Townrow, 1957). Thus it appears that *Rewaphyllum* is fairly represented in the Triassic formations of the Gondwanaland.

Shyam C. Srivastava

A large number of shale samples collected from Nidhpur were macerated in bulk and good many leaves, fruiting bodies, seeds and megaspores have been recovered. Camera lucida sketches of about 200 seeds and 50 fruiting bodies have been drawn; about 100 seeds have been photographed. More than a dozen seeds have been dissected, cuticular slides of different parts have been prepared and their microphotography has been done.

Shyam C. Srivastava and S. R. Manik

A new species each of *Sphenobaiera* and *Yabeiella* have been described from the Tiki Formation.

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*

Revision on *Pentoxylon* and their associated genera *Nipaniophyllum*, *Sahnia* and *Carnoconites* has been done on the basis of old as well as a good number of freshly collected specimens. A paper entitled "The *Pentoxylon* plant" has been finalized.

M. N. Bose, P. K. Pal and T. M. Harris

Description of *Culcitites lobatus* (Oldham) comb. nov. has been written.

M. N. Bose and P. K. Pal

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

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

About 45 specimens of *Sphenopteris*, *Brachyphyllum*, *Pagiophyllum* and *Araucarites* have been photographed. A number of cuticular slides have been prepared. A few shale samples have been macerated in bulk and some seeds, megaspores and cuticular pieces have been recovered. Descriptions of some species of *Phlebopteris*, *Sphenopteris Brachyphyllum*, *Pagiophyllum*, etc. have been written.

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*

A number of Lower Cretaceous plants of India were photographed. Besides, about 30 specimens of *Hausmannia*, *Onychiopsis*, *Cladophlebis*, *Sphenopteris*, *Yabeiella*, *Ginkgoites*, *Elatocladus* and *Araucarites* from Chandia and Tarnetar have been photographed. Maps of the localities and draft introduction part have also been prepared Descriptions and text-figures of some pteridophytes and conifers have been prepared.

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*

The genera *Ptilophyllum*, *Dictyozamites*, *Otozamites*, *Bucklandia*, *Williamsonia* and *Rajmahalia* have been partly worked out.

Amongst the conifers, somes pecies of *Elatocladus*, *Desmiophyllum* and *Araucarities* have been described. Their photographs and text-figures are being prepared. Numerous seeds, sporangia and cuticle-pieces as well as *Caytonia* specimens have been recovered from the rock samples maceerted in bulk.

M. N. Bose and Jayasri Banerji

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

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

Thin ground sections of About 70 fossil wood pieces have been prepared and microscopic observations made. Preliminary descriptions of some species have been written. Some of the wood sections and about 15 megafossils have been photographed.

Sukh-Dev and A. Rajni Kanth

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*

References and short notes of the literature have been prepared.

Sukh-Dev and A. Rajni Kanth

A paper on "*Thinnfeldia indica* Feistmantel and associated plant fossils from Tiruchirapalli District, Tamil Nadu" was completed and submitted for publication. Plant mega- and micro-fossils recovered from the Teraini Clay pits and a tube well near Naicolam have been listed. Epidermal features of *T. indica* have been described in detail and its affinities traced to the cycads. On the basis of totality of characters,

an independent taxonomic status of the genus *Thinnfeldia* vis-a-vis the genera *Dicroidium* and *Pachypteris* is confirmed. Data pertaining to the age of Utatur plant beds is briefly reviewed.

H. K. Maheshwari

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

Objective : *To study morphotaxonomy of spores, pollen and dinoflagellate cysts and their application to the stratigraphy of the basin*

Qualitative and quantitative analysis of palynomorphs was continued. Preparation of the manuscript was started. Photomicrography is also in progress. Counting of productive samples for per cent frequency of palynomorphs has been completed for the Lower and Middle members of the Jhuran Formation exposed in the Jhuran River Section. Per cent frequency of palynomorphs has also been worked out in a few productive samples from the Bhuj Formation type section in Rukmavati River.

Some more megaspores have been isolated from samples of Bhuj Formation collected from a well near Kera Village. A large number of specimens of the genus *Paxillitriletes* has been found in the Bhuj Formation exposed near Nangor.

Photomicrography of a number of dinoflagellate cyst taxa has been done. Identification of taxa has been continued.

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

A paper reviewing 'Cretaceous spore-pollen complexes from India' was also prepared.

H. K. Maheshwari and B. N. Jana

Department of Cenophytic Evolutionary Botany

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

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

A manuscript entitled "A podocarpaceous wood from the Deccan Intertrappean beds of Malabar Hills, Bombay" was submitted for publication. The present finding forms the first authentic record of Podocarpaceae in the Deccan Intertrappean flora of India and confirms the presence of this family during the Early Tertiary of the Indian subcontinent.

U. Prakash and M. B. Bande

Two fossil woods resembling *Artocarpus* of Moraceae and *Lophopetalum* of Celastraceae, collected from near Shahpura in Mandla District, were studied in detail, photographed and a manuscript prepared.

U. Prakash and R. C. Mehrotra

A paper entitled "*Euphorbiocarpon drypeteoides:* A new euphorbiaceous fruit from the Deccan Intertrappean beds of Mandla District, Madhya Pradesh" was submitted for publication. The fruit is a small, usually three-seeded drupe showing near resemblance with the fruits of extant *Drypetes* Vahl.

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

Forty fossil dicotyledonous woods and two petrified monocot fruits from near Shahpura in Mandla District were also sectioned, studied and photographed. These woods have been identified with the extant taxa *Barringtonia*, *Grewia*, *Gomphandra Polyalthia*, *Canarium*, *Ailanthus*, *Semecarpus* and *Heynea*, while the fruits resemble those of *Areca* and *Cocos* of Palmae.

R. C. Mehrotra

Study of a palm peduncle *Palmostroboxylon arengoides*, resembling *Arenga* from Mandla District was completed and the manuscript submitted for publication. Besides, a fossil palm stem, *Palmoxylon dilacunosum*, with a distinct lacunar ground tissue, was described, photographed and a manuscript prepared. In order to identify the fossil palm stems and petioles and to find out the variability in anatomical characters, serial sections of the stem of *Trachycarpus khasyana* (measuring about 2 m from base to apex) were prepared and studied. In addition, the serial sections of *Elaeis guinensis* petiole were also photographed.

Krishna Ambwani

The manuscript of a paper on "Evolutionary trends in the secondary xylem of woody dicotyledons from the Tertiary of India" was completed and submitted for publication.

M. B. Bande and U. Prakash

Ten fossil woods collected from Nawargaon were described, photographed and identified with the modern taxa of the families Apocynaceae, Verbenaceae, Burseraceae, Meliaceae and Euphorbiaceae.

M. B. Bande

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

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

A fossil wood of *Terminalia* was identified from near Jaisalmer. A manuscript describing two gymnospermous woods belonging to *Araucarioxylon* and *Podocarpoxylon* and two angiospermous woods, viz., *Millettioxylon* and *Terminalioxylon* was prepared.

A fossil wood of *Sonneratia* was identified from the Lower Miocene beds near Santalpur in Kachchh District. Leaf-impressions of *Avicennia* of Verbenaceae, *Ceriops* of Rhizophoraceae,

Flemingia of Papillionaceae, and *Terminalia* of Combretaceae have also been identified from the Lower Miocene beds of Kachchh. A paper entitled "Occurrence of anacardiaceous woods in the Tertiary of western India" describing fossil woods of *Glutoxylon and Mangiferoxylon* from Banaskantha and Jaisalmer districts of Gujarat and Rajasthan respectively was finalized and submitted for publication.

A draft manuscript entitled "Bibliography of Indian palaeobotany for 1981-82" was prepared.

J. S. Guleria

A paper on "A preliminary appraisal of the Tertiary megaflora of Kachchh District, Gujarat, western India" was finalized and submitted for publication.

R. N. Lakhanpal and J. S. Guleria

Work on a monograph on the Tertiary megaflora of Kachchh was continued.

R. N. Lakhanpal, N. Awasthi and 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*

Detailed study of fungal fruiting bodies and angiospermous remains obtained from sectioning the Neyveli lignite was undertaken. Five lignite samples were also macerated and slides of cuticles of the monocot leaves were prepared.

Krishna Ambwani

A new petrified wood was identified as *Xanthophyllum* of the family Polygalaceae showing close resemblance with the Burmese species, *X. flavescens*. The identification of some dipterocarpaceous and leguminous woods studied earlier from near Pondicherry was confirmed.

Some more carbonised woods from Neyveli were studied and one of them was identified as *Barringtonia* showing close resemblance with *B. cymosa*. A draft manuscript of a paper describing six dicotyledonous woods was also prepared.

Nilambar Awasthi

Several compressions and impressions of leaves from Neyveli Lignite Mine I were photographed, described and cuticular slides prepared. In order to identify these leaf compressions from their cuticular structures, permanent slides of the leaf cuticles of several species belonging to the families Anacardiaceae, Boraginaceae, Combretaceae, Dipterocarpaceae, Ebenaceae, Guttiferae, Leguminosae, Lythraceae and Sapotaceae were prepared.

Nilambar Awasthi and Anil Agarwal

A large number of carbonized woods from Varkala, Padappakara and Pyangadi in Kerala were sectioned, studied and photographed. A few of them have been identified as *Leea*, *Gonystylus* and *Gluta-Melanorrhoea*. A paper describing these woods has been finalized. The other woods have been tentatively assigned to Dipterocarpaceae, Rutaceae, Leguminosae and Lecythidaceae. Besides, some leaf-impressions from Varkala were also studied, photographed and tentatively identified with the taxa of Dipterocarpaceae, Anacardiaceae and Lauraceae.

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*

Two fossil woods collected from the Lower Siwalik beds of Kalagarh were studied in detail, photographed and identified with the modern taxa *Bauhinia* of Leguminosae and *Shorea* of Dipterocarpaccae and a manuscript was prepared.

U. Prakash and Mahesh Prasad

A number of fossil woods from the Lower Siwalik beds of Kalagarh were further cut, studied and photographed. A few of them are new which show close resemblance with *Terminalia* and *Anogeissus* of Combretaceae, *Hopea* of Dipterocarpaceae and *Diospyros* of Ebenaceae.

Leaf-impressions from the Lower Siwalik beds of Koilabas in Nepal have also been studied. About 20 types of leaves have been identified with the modern taxa *Syzygium, Calycopteris, Terminalia, Anogeissus, Tabernaemontana, Millettia, Diospyros, Mesua, Cassia, Ficus, Datura* and *Randia*.

Mahesh Prasad

A collection of leaf-impressions from the Siwalik beds of Bhikhnathoree, Bihar was further studied. They show close similarity with the leaves of *Derris scandens, Urena lobata, Persea lanceolata, Adhatoda vassica* and *Syzygium bracteata*.

R. N. Lakhanpal and Nilambar Awasthi

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

Objective : *To study the Tertiary vegetation of north-eastern India*

A collection of petrified woods from near Bolpur in West Bengal was examined and thin sections of 50 woods were prepared

and studied. A fossil wood of Araucariaceae has been identified and a few new forms belonging to Anacardiaceae, Meliaceae and Leguminosae have been recognized. The presence of the family Araucariaceae forms the first record in the Neogene of the Indian subcontinent. The fossil woods of *Cynometroxylon*, *Millettioxylon*, *Ormosioxylon*, *Cassinium*, *Dipterocarpoxylon*, *Shoreoxylon*, *Chisochetonoxylon* and *Melanorrhoeoxylon* were further identified.

U. Prakash and G. P. Srivastava

About 150 leaf-impressions from the Palaeogene near Cherrapunji in Meghalaya and the Oligocene of Assam were examined. Out of these twenty leaf-impressions belonging to dicots and monocots were photographed.

Krishna Ambwani

Further investigation of petrified woods from Namsang River beds at Deomali in Arunachal Pradesh has revealed the presence of some more dicot taxa, viz., *Euphoria* of Sapindaceae, *Givottia* of Euphorbiaceae and *Antiaria* of Moraceae.

U. Prakash and Nilambar Awasthi

Identification and description of eight fossil woods from the Tipam sandstones of Assam were finalized with the modern taxa *Calophyllum*, *Dipterocarpus*, *Hopea*, *Shorea*, *Schleichera-Euphoria-Otonephelium-Nephelium* complex and *Gluta-Melanorrhoea*.

U. Prakash

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 period*

A number of carbonised woods from the Lower Karewa beds of Kashmir were studied and identified with *Pinus*, *Abies*, *Cupressus*, *Juglans* and *Populus*. Besides, the leaf-impressions resembling

Acer, Aesculus, Populus, Quercus, Ulmus and *Pteris* were also identified and a manuscript was prepared.

Nilambar Awasthi and J. S. Guleria

Tertiary from Abroad

Studies on the fossil woods from Burma

A collection of fossil woods from the Neogene of Burma was studied after preparing a large number of sections. Besides the identification of fossil woods of *Cynometra* and *Cassia*, some new woods of Araucariaceae and Leguminosae were recognized.

U. Prakash

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 "Dust thou art palynology" defining the scope of palynology was prepared.

Vishnu-Mittre

The ecological and habitat analysis of modern diatoms described and published from 600 to 5,000 m in the Himalaya has been carried out and a manuscript including the ecological and habitat significance of the diatoms known from the Karewa deposits was prepared.

Vishnu-Mittre

About 580 pollen slides of 116 taxa distributed in the Silent Valley were prepared and studied. Pollen key prepared is based upon pollen diagnoses of 130 taxa. Pollen index cards for the same have also been prepared.

Vishnu-Mittre and H. A. Khan

Based upon morphographical, statistical and scanning microscopical studies of spikelets of the two related wild perennial and annual (*Oryza rufipogon*, *O. nivara*) and the cultivated strain (*O. sativa*) of rices, diagnostic characters have been collected to identify the imprints of rices.

Plant raised from seeds of modern *E. coracana* subsp. *africana* discovered for the first time from India has been found to be tetraploid.

Vishnu-Mittre and Aruna Sharma

Pollen key for the Pollen Flora of north-west Himalaya was prepared. The manuscript has been submitted for publication.

H. P. Gupta and Chhaya Sharma

Pollen morphological studies of five species of *Toona* and seven of *Cedrela* from among the world collection were completed. The studies did not reveal differences to distinguish the two genera from their pollen grains.

Chhaya Sharma and M. S. Chauhan

The modern algal material collected from Ladakh have been preliminarily identified.

A. Bhattacharya

Pollen slides of 450 plant species distributed in district Sidhi, Madhya Pradesh were prepared and a Pollen Key based on their palynological studies was prepared.

S. K. Bera and M. S. Chauhan

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 manuscript on the floristic changes from the mid-Tertiary to the recent has been finalised from the data available from the southern slopes of Himalaya and the Siwaliks.

Evaluating the available pollen analytical evidence, present day climatic requirements and the distribution of the fossil taxa identified, a manuscript "Did the arid zone of western Rajasthan extend beyond the Ganga-Yamuna Doab during the Holocene times" was prepared.

A paper on Quaternary Palaeobotany/Palynology in the Himalaya—An overview was submitted for publication. This paper incorporates the data on the critical appraisal of the fresh litho-, chrono and biostratigraphic studies and archaeobotany.

Vishnu-Mittre

Collating the data on the dated pollen events with contemporary geomorphological changes all over the country, a manuscript 'Pollen stratigraphy of India' was prepared.

Vishnu-Mittre, Chhaya Sharma, A.K. Saxena, Kamla Prasad and A. Bhattacharya

The pollen-analytical work on the trans-Himalayan region of Ladakh and Lahul Spiti comprising two bore-cores 23 m and 52.6 m from Tsokar Lake dating from pre 40,000 to 10,000 yrs and small cores from Mari and Batal in the Lahul-Spiti region covering the Holocene period has been completed. The pollen analytical data has been interpreted in the background of copious modern pollen/vegetation relationship determined in the trans-Himalayan, alpine and temperate regions of the western Himalaya. The data have brought out alterations between stadials and interstadials as inferred from the alterations in steppe and Juniper expansions in Ladakh and between Steppe and *Ephedra* or *Betula* and finally the constitution of Birch-Fir-Oak woods under the climatic amelioration. The interstadials are dated by radiocarbon method and the one between 28,000 – 32,000 has also been recognised in Europe, while the others find close comparison with those recorded in Europe. This work has been submitted in a Ph.D. dissertation titled "Studies on the vegetational history of the Alpine region of the north-west Himalaya.

A. Bhattacharya and Vishnu-Mittre

To understand the significance of *Larix* type pollen grains in our pollen diagrams (recovered also in the Tsokar Lake profile TP6), 10 modern moss cushions from the *Larix* forest have been macerated.

The study of samples from the valley of flowers has been undertaken to find out the past floristic changes there.

The pollen analysis of two trial samples (Stratum (7A) B-1 and 13B) from the archaeological site—Srinaverpura—revealed that they are rich in seeds and other organic matter but devoid of pollen.

Vishnu-Mittre and A. Bhattacharya

Pollen analysis of 50 modern surface samples, moss cushions and mud samples from Amgaon, Bastua, Pondi, Chunipat and Tingi in district Sidhi has been completed. The samples from within the forest have revealed dominance of *Shorea robusta* pollen together with pollen grains of *Anogeissus*, *Terminalia* and *Emblica officinalis* the other constituents of the deciduous Sal forest whereas those from the open show infrequent occurrence of Sal pollen. In both cases, pollen grains of Cyperaceae and grasses occur in high values, higher in the open than within the forest. Himalayan pollen such of *Pinus* and *Alnus* have also been found in some samples.

Pollen analysis of 40 samples from a 2.48 m deep profile dating from 6720 ± 110 yrs B. P. (BS-410), also from Amgaon has been completed. The sequence shows predominance of pollen of sedges and grasses. The deciduous taxa including the dominant *Shorea robusta* are represented by small frequencies.

Vishnu-Mittre and M. S. Chauhan

Twentytwo samples from 6.20 m deep profile from Naukutchiya Tal, Kumaon Himalaya were pollen analysed. The sequence shows dominance of *Chir-Pine-Oak* mixed woods with *Abies* as a codominant. The non-arboreals are represented largely by Poaceae.

H. P. Gupta and Asha Khandelwal

Four modern moss cushions from near Parasram Tal, district Sirmur, Himachal Pradesh were pollen analysed and the pollen spectra reveal the dominance of *Pinus roxburghii* pollen which does not grow in this area.

The pollen analysis of four bottom samples from another profile from Rewalsar, district Mandi has revealed the dominance of pollen of oak-mixed broad-leaved constituents.

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*

A paper on vegetation and climate during the last glaciation in the Kathmandu Valley, Nepal was finalised and sent for publication.

Vishnu-Mittre and Chhaya Sharma

Project : *History of the Silent Valley forests*

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

From the careful collection of pollen analytical data on the history of tropical evergreen forests of south and south-east Asia, Africa and South America, a paper titled "How old are the tropical evergreen forests?" was completed. The data reveal that these forests were reconstituted between 12,000—8,000 yrs. ago.

Vishnu-Mittre

Three samples of profile-1 collected from the Silent Valley were macerated. The identfication of pollen has partly been completed.

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*

The application of advanced statistical analysis and scan microscopy has aided further in identification of remains of the crops. It has also helped in the discovery of ancestor of Ragi

(*Eleusine coracana*). The studies of plant remains from seven Neolithic, eight chalcolithic, four late Harappan and five historical sites have been completed. A comparative account of plant economies of these sites in time and space has been built up. The data have been compiled in a Ph.D. dissertation entitled "Further contributions to the palaeobotanical history of Crops".

Aruna Sharma and Vishnu-Mittre

Carbonised wild seeds from the charred lumps from the Harappan site, Surkotada in Kachchh were segregated into 15 types. Some of these have been tentatively identified to species of *Setaria, Poa, Portulaca, Cheno-ams, Carex*, etc. The seeds of *Eleusine coracana* (Ragi) have also been found. The description of the charcoals and their tentative identification was completed.

Vishnu-Mittre and Chanchala

The investigation on carbonized grains and charcoals from the site Sringaverpura (C. 1050-700 BC), a chalcolithic site in Uttar Pradesh has been undertaken. Preliminary identifications reveal that the plant economy at this site consisted of rice, wheat, barley, sesame, gram, *Phaseolus* sp. and cotton. Evidence of *Saccharum spontaneum, S. munja* and the date palm—*Phoenix sylvestris* —has also been observed.

K. S. Saraswat

The tentative identification of charcoals from Gufkral, Diamabad, Sonegaon, Kayatha, Besnagar, Veerapuram, Rampuram, Singh-Bhagwantpur, Lekhania, Rajgir, and Nagara was done.

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*

Both the qualitative and quantitative data on pollen catch in the month of March has shown preponderance of pollen of *Holoptelea* in the pollen catches.

Collection of local plants, preparation of reference collection and gathering of records, etc. on pollination time have also been done.

Two manuscripts "Changing flowering of plant species and its significance" and "Modern pollen sedimentation at Lucknow" were completed.

Vishnu-Mittre and Asha Khandelwal

Studies of pollen production, dispersal and sedimentation in the Sal forest were commenced in district Sidhi, Madhya Pradesh. The data has been gathered on pollen production per anther, per flower, per tree and per population and it has been found that the Sal Tree is a very high pollen producer, i.e. 22, 497, 877, 891, 424×10^3 pollen grains. Pollen sedimentation has been studied by trapping pollen at different tree heights in petridishes or on filter paper and through study of modern surface samples. The data reveals a very high percentage of Sal pollen near the trunk space and at the base of trees whereas it is comparatively less in the forest canopy. In modern surface samples pollen grains of sedges and grasses predominate over those of Sal and other deciduous associates.

Temperatures within the Sal forest during flowering season of Sal vary from 18° — 42°C with mostly westerly wind direction. The average wind speed has been found to be 1.5—4.5 m/second and it is high immediately at noon. Most of the days are shiny,

clouds appearing in the afternoon on few days only. The relative humidity varies from 50–90 per cent.

Vishnu-Mittre and 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 archaeobotanical and palaeopalynological data*

The ethnobotanical data on the arboreal taxa particularly whose remains are found in the archaeological sites has been documented to assess the various aspects of human influence upon wild plant life, and to evaluate the direction and magnitude of the anthropic exploitation of forest ecosystems in the immediate past.

Vishnu-Mittre and Chanchala

Department of Pre-Gondwana and Gondwana Palynostratigraphy

Project.. : *Palynostratigraphy of Indian coal deposits*

Objective : *Stratigraphic delimitation and correlation of coal seams*

Subproject : *Palynostratigraphic studies of the Lower Gondwana sediments in Jharia Coalfield, Bihar*

The palynological study of the sediments in bore-hole M.D.-8 from Madhuban area has revealed that the prominent occurrence of the genus *Densipollenites* starts well before the Barakar/Barren Measures boundary and consequently indicates a relatively earlier deterioration of the climate in this region of the Peninsular India during the late Permian.

R. S. Tiwari and Archana Tripathi

Subproject : Palynostratigraphy of the Lower Gondwana sediments in Godavari Valley

The mioflora of the Lower Gondwana sediments, accosted in bore holes GJ3 and GJ6 from Chelpur area, exhibits the dominance of striated-disaccate pollen grains in the lower part while it is associated with *Densipollenites* in the younger part. These sediments have been found equivalent to the Lower and Middle Kamthi miofloras encountered in Ramagundum area. Samples of the bore-holes GM3, GM4, GM5 from Manuguru area were also processed but the recovery of miospores was poor.

Suresh C. Srivastava and Neerja Jha

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

Palynostratigraphy of the Lower Gondwanas from Talchir to Raniganj formations in West Bokaro Coalfield was finalised and the results have been compiled in a Ph.D. dissertation.

Rakesh Saxena and Suresh C. Srivastava

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

Samples of the bore-hole CMPS-43, Shobhapur Block, Pathakhera Coalfield were studied palynologically. The miospore assemblage in the lower-most coal seam corresponds with the Karharbari mioflora while the younger sediments have been found to contain early Barakar mioflora. Besides coal seams presently being worked out in the Pathakhera Coalfield have also been examined and compared with the older coal seams of the bore-holes of Shobhapur Block.

Subproject : Palynostratigraphy of the Lower Gondwana sediments in South Rewa Gondwana Basin, Madhya Pradesh, India

A. *Umaria Coalfield*—On the basis of palynostratigraphic studies four palynozones have been recognised in Umaria Coalfield. The oldest zone is marked by the dominance of *Callumispora-Jayantisporites*, representing the Lower Karharbari mioflora. The overlying palynozone of Upper Karharbari contains monosaccates in dominance. Lower and Upper Barakar miofloras are characterised by nonstriated and striated-disaccates, respectively.

Suresh C. Srivastava and Anand Prakash

B. *Johilla Coalfield*—Four miofloral zones ranging from Lower Karharbari to Upper Barakar have been demarcated resembling those of the Umaria Coalfield.

Anand Prakash and Suresh C. Srivastava

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

Identification and quantitative estimation of palynological assemblages recovered from productive samples of Jhuran River Section and Rukmawati Kiver Section have been carried out. In 37 samples from Jhuran, it has been noticed that the genus *Araucariacites* is the dominating form in all samples except one where hystrichosphaerids are dominant. Microplanktons in different percentages are found almost in all samples. The tetrad and individual grain of the genus *Classopollis* have been found in many samples. The pteridophytic genera are qualitatively poor.

The samples of Rukmawati River Section show qualitative richness of the pteridophytic genera. The hilate spore genera, such as *Aequitriradites*, *Cooksonites*, *Coptospora* and *Triporoletes* are usually encountered in most of the samples. Some of the important pteridophytic genera are *Foveotriletes*, *Boseisporites*, *Klukispori-*

tes, Matonisporites Cicatricosisporites, Contignisporites, Ischyosporites, etc. The genus *Araucariacites* is dominant in the samples so far studied.

H. K. Maheshwari and B. N. Jana

About 25 megaspores have been sorted out from bulk maceration of Dharesi and Walkamota samples. Gradational maceration and microphoto-negative preparation of about 50 megaspores recovered from Dharesi, Kera, Daisera and Walkamota of Kachchh have also been done. The megaspore genera so far recovered in the Kachchh assemblage (Jurassic-Cretaceous) are: *Banksisporites, Hughesisporites, Bacutriletes, Verrutriletes, Horstisporites, Minerisporites, Paxillitriletes, Dijkstraisporites, Erlansonisporites.*

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

A paper entitled 'A miospore assemblage from the Pipli borehole, Surendranagar District, Gujarat, India' has been finalized and submitted for publication.

B. N. Jana

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

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

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

In sequel to the earlier studies, the Supra-Barakar sediments in the Birsinghpur-Pali area were studied. Some samples have yielded spores and pollen grains. The Parsora beds, however, show a Lower Triassic aspect.

R. S. Tiwari and Ram Awatar

A rich miofloral assemblage recovered from Johilla River Section has been described. The assemblage is dominated by striate-disaccate genera. However, characteristic Triassic forms like *Satsangisaccites*, *Nidipollenites* and *Weylandites* are also commonly met with. The assemblage appears to be of Lower Triassic age.

R. S. Tiwari and P. K. Pal

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

Sediments in bore-hole RAD-5 in the eastern most region of the East Raniganj Coalfield have been studied. This study reveals a defined and definite miofloral change at the Permo-Triassic boundary, the yield of the miospore being at a close interval near the boundary.

R. S. Tiwari and Vijaya Singh

Samples from the bore-hole RAD-8 from the Raniganj Coalfield have yielded a rich mioflora.

R. S. Tiwari and K. L. Meena

Subproject : Palynostratigraphic studies of the Gondwana sediments in Rajmahal Basin

Rajmahal area is promising as new coal reservoirs are being proved in a wide region. In view of this fact, two bore-holes RJR-2 and RJNE-9, have been taken up for the palynological study. The quantitative analysis is being done to build up the miospore succession. The results indicate a new variation in lateral extent.

R. S. Tiwari and Archana Tripathi

From Bore cores RJR-2/9 and ECL-10/1 a good miospore assemblage has been received. The qualitative and quantitative investigations have partly been completed. About 64 miospores have been photographed. Palynologically, the sample no. BC-ECL-10 shows the presence of *Scheuringipollenites*, *Plicatipollenites*, *Parasaccites*, etc. indicative of Lower Permian age, whereas sample BC-RJR-2/9 underlying the Trap no. 3 possesses the Jurassic mioflora like *Callialasporites*, *Podocarpidites* and *Araucariacites*, etc.

Pramod Kumar

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

From the palynostratigraphic study of the Permian and Triassic sediments from the Malla Johar area, more evidences have come to light which indicate a Gondwana affiliation of these miofloras.

R. S. Tiwari and Vijaya Singh

Subproject : Palynostratigraphic studies of the Lower Gondwana sediments of Arunachal Pradesh

The study of the Lower Gondwana sediments of Arunachal Pradesh (Siang District) has been undertaken in order to build up a succession of miofloras.

Suresh C. Srivastava

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

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

Biostatistical analysis of some Lower Gondwana miospores is being continued.

Archana Tripathi

Morphographic study of some Lower Gondwana Miospores has been done to evaluate their characters and circumscription, in view of the recent knowledge and up to date information.

R. S. Tiwari and Archana Tripathi

Collection of detailed palynological data regarding some important Triassic miospore taxa of India has been started.

R. S. Tiwari and Vijaya Singh

Morphotaxonomic circumscription of the *Sporae dispersae* of the Godavari Valley Coalfield has been continued.

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

Department of Post-Gondwana Palynostratigraphy of Peninsular India

Project : *Palynostratigraphy of Neogene sediments in Kachchh*

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

Systematic description of microfossils recovered from the Khari Nadi Formation (Miocene) was completed. Spores and pollen genera comprise *Biretisporites, Dictyophyllidites, Striatriletes, Lycopodiumsporites, Cingulatisporites, Pteridacidites, Laevigatosporites, Psiloschizosporis, Pinuspollenites, Abiespollenites, Piceapollenites, Podo-*

carpidites and *Tsugaepollenites*. The microplanktons were described under *Achomosphaera, Cordosphaeridium, Hystrichokolpoma, Lingulodinium, Spiniferites, Thalassiphora* and *Tuberculodinium.*

R. K. Kar

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

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

The identification of the genera recovered from Sonrai, Lalitpur District, Uttar Pradesh was confirmed. These are: *Todisporites, Lygodiumsporites, Cyathidites, Lycopodiumsporites, Podocarpidites, Palmaepollenites, Tricolpites, Stephanocolpites, Polycolpites* and *Phragmothyrites.*

R. K. Kar

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

Systematic taxonomy of spores and pollen grains recovered from Palaeocene, Eocene, Oligocene and Miocene sediments was completed. Histograms were also finalized to demarcate the various palynological zones. Important palynological taxa have been photographed.

The spores of *Ceratopteris* of the family Parkeriaceae which in the fossil state is known as *Striatriletes* were studied in detail. It was advocated that India was most probably the original homeland of *Ceratopteris* because the fossil spores are known from the Middle-Upper Eocene whereas in Caribbean island, Nigeria, Malaysia and other countries it has been recorded from Oligocene onwards. Due to its wide geographical occurrence in Oligocene-Miocene in pantropical countries, a palaeogeographical province has been instituted for this genus.

R. K. Kar

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

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

The palynostratigraphical study on the deep core samples from the Bengal Fan was continued and a few more samples were re-macerated to obtain better results. Counting of palynotaxa of some samples has been completed.

Anil Chandra

The palynological study of the Arabian Sea sediments collected under the XVII and XVIII oceanographic cruises of R. V. Gaveshani has been completed.

A manuscript on the different types of thyriothecia recovered from the surface sediments of the Arabian Sea was submitted for publication. The abundance of fungal fruiting bodies in the oceanic sediments shows that they are common parasites on the tropical forest along the western coast of India. It has been surmised that their transport to the sea is by water currents.

Ram Ratan and Anil Chandra

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

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

Fiftyfour surface samples from the Baragolai Formation were macerated. The assemblage is dominated by pteridophytic spores followed by angiosperm pollen. Gymnospermous grains are almost absent.

Systematic description of the palynomorphs recovered from Cherrapunji area was completed. The assemblage is dominated by pteridophytic spores mostly represented by *Lycopodiumsporites, Foveotriletes, Cyathidites* and *Dandotiaspora.*

J. Mandal

Rock samples from Cherrapunji Plateau and Langrin Coalfield in Meghalaya were chemically processed. Out of 360 samples only 60 samples were found to be productive. The clay and limestone samples from Cherrapunji were found to be barren. The Langrin Coalifield samples were found to be palynologically rich and the slides were prepared and scanned.

Rock samples collected from the type locality of Jadukata and Mahadek formations, Dawki, Pungtung-Lynghet Road Section and Nongnah were chemically processed. Out of 380 samples about 140 samples were found to be productive. The important and well-preserved taxa were photographed. The assemblage comprises the genera *Cyathidites, Cicatricosisporites, Appandicisporites, Densoisporites, Gleicheniidites, Dictyophyllidites, Lycopodiumsporites, Todisporites, Alsophillidites, Osmundacidites, Cingulatisporites, Biretisporites, Leotriletes, Intrapunctisporites, Punctatisporites, Triporoletes, Lycopodiacidites, Lophotriletes, Klukisporites, Laevigatosporites, Leptolepidites, Laricoidites, Concavisporites, Cyclogranisporites, Foveosporites, Callialasporites, Contignesporites, Amucariacites, Podocarpidites, Microcathrydites, Foveomonoletes, Polypodiaceaesporites, Monocolpites, Tricolpites* and *Triorites.*

R. S. Singh

About 60 surface samples collected from Maibang Road Section were macerated. Out of which only 31 samples yielded pollen and spores. Slides from the productive samples were prepared and scanned.

G. K. Trivedi

Out of 195 rock samples from Cherrapunji, Momluh, Laitryngew, Sohrarim, Mowlong, Shillong-Cherra road and Lakadong, only 85 samples proved to be productive. Preliminary observations show that the assemblage consists of *Dandotiaspora*, *Lycopodiumsporites*, *Cyathidites*, *Foveosporites*, *Liliacidites*, *Polycolpites*, *Palmaepollenites*, etc.

Madhav Kumar

In all, about 186 samples collected from the Ledo Colliery of the Tikak Parbat Formation (Oligocene) were processed, out of which only 110 samples yielded palynomorphs. Their slides were prepared and scanned. The assemblage is dominated by pteridophytic spores mostly represented by *Lygodiumsporites*, *Foveosporites*, *Striatriletes*, *Lycopodiumsporites* and *Gleicheniidites*. Angiospermic pollen grain *Couperipollis* is also occasionally found.

B. D. Mandaokar

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*

The palynostratigraphical studies of the Palaeocene-Eocene sediments of Jowai-Badarpur Road Section in Maghalaya and Lower Assam were completed. Based on the qualitative and quantitative distribution of palynoassemblages, correlative value of the palynozones in Assam and Meghalaya was established. Palynological evidence suggests that a warm and humid climate prevailed during the Palaeocene-Eocene time.

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

A manuscript entitled "Two new pollen genera from the Lower Tertiary sediments of Meghalaya" was finalized and sent to press for pulication. The specimens belonging to these genera were recovered from the Jaintia Group (Palaeocene-Eocene) of Meghalaya. These genera have been compared in detail with the known genera.

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

A manuscript on a comparative study of the spores of *Ceratopteris thalictroides* (L) Brongn. and *Striatriletes* van der Hammen emend. Kar (1979) was finalised and submitted for publication. Specimens of *Ceratopteris thalictroides* were collected growing in different ecological conditions. Their spores were studied morphologically in order to observe the range of variation as related to habitat. The analysis of data reveals that the qualitative characters of the spores remain more or less uniform whereas the quantitative characters exhibit a wide range of variation. On the basis of this study taxonomy of fossil forms of *Striatriletes* has been re-examined and an attempt has been made to clear the existing mess.

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

Systematic palynological study of the Barail-Surma groups (Oligocene-Miocene) of the Sonapur-Badarpur Road Section in Meghalaya and Assam was finalised. Introduction, geology and discussion parts were also written and finalised. The discussion part includes qualitative and quantitative analyses of the palynoflora, its comparison with other known contemporaneous assemblages, palynostratigraphic zonation, palaeoclimate, environment of deposition and interpretation regarding age of the sediments. Botanical affinities of the playnomorphs have been given, wherever possible.

H. P. Singh, R. K. Saxena 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*

A manuscript dealing with a new pteridophytic spore genus named *Amtaspora* gen. nov. represented by two species has been finalised and submitted for publication. Specimens belonging to this genus have been recovered from the Upper horizons of the Subathu Formation exposed in the Banethi-Bagthan area, Himachal Pradesh. The genus has been compared with the existing known genera.

Samir Sarkar and H. P. Singh

Palynological study of spores and pollen grains recovered from the Kasauli sediments exposed near Banethi, Himachal Pradesh has been completed and a manuscript has been submitted for publication. The palynological data reveals the presence of well-preserved pteridophytic spores, and gymnospermous and angiospermous pollen grains. The fungal remains are represented by spores, conidia and ascostromata. The assemblage throws light on the environment of deposition and palaeoclimate.

A paper entitled, "Significant palynozones of Subathu Formation (H. P.) and their bearing on stratigraphy" is being finalized. The study reveals the distribution of Subathu assemblages in time and space. It also highlights the correlative value of palynozones of the Kalka-Simla and Banethi-Bagthan areas of Himachal Pradesh.

A rich dinoflagellate cyst assemblage has been recovered from the Koshalia River Section, Himachal Pradesh. Morphotaxonomic study of the recovered palynomorphs has been undertaken.

H. P. Singh and Samir Sarkar

Chemical processing of the Subathu samples collected from Dadahu area near Giri River banks and Jhamuta-Dadahu Road was carried out for the recovery of palynomorphs. However, the recovery has been poor as the organic matter is not well-preserved.

H. P. Singh and Asha Gupta

About 147 samples belonging to the Subathu and Dharamsala groups developed in Manji Khad, Jhol and Khanyara sections around Dharamsala in Kangra District of Himachal Pradesh were macerated. Of these, 18 samples proved to be productive. The slides of the productive samples were scanned. The assemblage consists of fungal remains, pteridophytic spores and gymnospermous pollen grains.

R. K. Saxena, H. P. Singh and A. P. Bhattacharyya

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

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

The systematic description of the palynoassemblage from the Siwalik sediments of Bhakra-Nangal area of Himachal Pradesh was finalised. The qualitative and quantitative analysis of the assemblage were done and the data were utilized in interpreting the palaeoclimate and depositional environment of the sediments. The assemblage was compared with the earlier recorded Siwalik assemblages and the similarities and differences between them were pointed out and discussed. A manuscript on this study was finalised and submitted for publication.

R. K. Saxena, Samir Sarkar and H. P. Singh

A detailed study of the dinoflagellate cysts recovered from five Siwalik sequences in Chandigarh and Himachal Pradesh was carried out, which reveals that these cysts are reworked from the Subathu Formation (Eocene). The significance of the assemblages and associated spore-pollen taxa in interpreting the source area formation of the sediments and their environment of deposition has been discussed.

R. K. Saxena and Samir Sarkar

Microscopical studies of slides of the Siwalik sediment of Nahan area have been taken up.

R. K. Saxena and A. P. Bhattacharyya

A manuscript entitled "A Siwalik palynoflora from Nalagarh-Ramshahr Road Section, Solan District, Himachal Pradesh" was finalized. The assemblage consists of 24 genera and 30 species. The Siwalik palynoassemblage, studied for the first time from this area, indicates a subtropical and humid climate.

Samir Sarkar and H. P. Singh

A paper on "Palynological investigations of Ramshahr Well no. 1, Himachal Pradesh" has been finalised and submitted for poblication. The assemblage consists of 20 genera and 25 species. On the basis of palyoofossils three distnict palynozones have been identified between 1,340 to 2,560 m depth levels. The palynological evidence has been utilised for the interpretation of age and environment of depcsition of the sediments.

H. P. Singh and Samir Sarkar

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

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

Dinoflagellate cysts and acritarchs recovered from five sediment cores from the Arabian Sea were photographed and their distribution chart was made. The systematic description and discussion of these palynomorphs were finalised and a manuscript on the study was submitted for publication.

R. K. Saxena, Anil Chandra and M. G. A. P. Setty

Project : *Palynostratigraphy of the Jurassic/Cretaceous sediments (Jabalpur Group) of the Satpura Basin*

Objective : *To study morphotaxonomy of the palynomorphs with a view to work out a detailed palynozonation of the Jabalpur Group rocks in the basin*

The palynological study of the Jabalpur Formation exposed on the banks of Hard River near its confluence with the Sakker River in Narsinghpur District, Madhya Pradesh was undertaken with a view to throw light on the age of the beds. A paper entitled "New palynological evidences on the age of Jabalpur Bed exposed at the confluence of Hard and Sakker rivers, has been prepared. Morphotaxonomy, quantitative and qualitative analyses of the assemblage have been carried out. It has also been compared with other similar assemblages known from India and abroad. Some new taxa of bryophytic affinity have been recorded and described.

H. K. Maheshwari and Asha Gupta

Department of Planktonology

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

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

The dinoflagellate cysts and acritarchs recovered from the sediments of Trichinopolly Formation Cauvery Basin, southern India were studied. The assemblage revealed the predominance of *Fibrocysta* and *Astrocysta*. Variation in microplankton constituents at various levels indicates biozonational potential.

Twenty-three dinocyst taxa have been identified from exploratory bore-hole drilled at Puduvoyal, Chingelput District, Tamil Nadu.

K. P. Jain and K. Ateequzzaman

Detailed morphology of the genus *Discorsia* has been worked out and new paratabulation formula has been proposed. A first draft of the manuscript was written.

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

Dinocyst morphology of the Jurassic sediments of Kachchh has been undertaken. The significant genera recovered and identified are *Adnatosphaeridium, Lithodinia, Egmontodinium, Chlamydophorella, Nannoceratopsis, Gonyaulacysta, Scriniodinium, Broomea peridictyocysta, Canningia, Nummus, Systematophora* and *Prolixosphaeridium.*

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

A manuscript on Upper Palaeocene dinoflagellate cysts and acritarchs from subsurface of Gopurapuram, Vriddhachalam was

completed. Besides morphotaxonomy, it includes the biostratigraphic and palaeoecologic implications of the dinocyst assemblage. The assemblage shows close resemblance with those known from Assam, India and several European areas. The uppermost Palaeocene age of the dinocyst assemblage is based on the occurrence of *Apectodinium homomorpha plexus* (with *A. hyperacantha, A. summisa* and *A. parva*). It is subsequently integrated with the calcareous mannofossils (*Discoaster multiradiatus* Zone, NP9), Planktonic Forminifera (*Morozovella velascoensis* Zone P5) and algae *Distichoplax biserialis*). A multidisciplinary approach in marine biostratigraphy has been emphasized.

K. P. Jain and Rahul Garg

A manuscript on Cenomanian Spumellarian Radiolaria from the Uttatur Formation, Southern India was completed. The radiolarian assemblage contains stratigraphically important species belonging to Actinommids, Saturnalins, Porodiscids, Spongurids, Hagiastrids and Pseudoaulophiacids. These show resemblance with the spumellarian assemblages recently known from the Upper Cretaceous of several deep sea cores, California coast ranges and Japan.

Rahul Garg

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

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

Samples from a Middle Eocene section exposed between villages Baranda and Jhadva (Ratchelo Nala), Kachchh area were studied. Exceptionally well-preserved assemblage of nannoplankton was detected in a sample of *Nummulites perforatus* zone. Nannoflora of this late Middle Eocene sample was documented

in detail and about 30 genera were identified. Nannoplankton data together with sedimentological parameters suggest extremely high hydrocarbon potential for the level studied.

S. A. Jafar and Jyotsana Rai

A detailed study of the samples collected from the basal part of Jhumara Formation (in type area of Jhumara Dome), Kachchh area was undertaken for recording the vertical distribution of calcareous nannoplankton. Nannoflora of this section was documented and the distribution of species belonging to genera : *Watznaueria, Stephanolithion, Axopodorhabdus, Zeugorhabdotus, Cyclagelosphaera, Ethmorhabdus, Polypodorhabdus, Diazmatolithus, Tubirhabdus, Striatococcus, Vekshinella, Palaeopontosphaera, Podorhabdus, Carinolithus, Calyculus,* and *Diadozygus* were compared with those from type sections of Boreal regime. Nannoplankton data supports Late Bathonian age for the basalmost units of Jhumara Formation (=Chari Formation) in Kachchh area.

S. A. Jafar and Rajesh K. Saxena

Department of Biodiagenesis

Project : *Palynostratigraphy of the Indian coal deposits*

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

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

The study dealing with palynostratigraphy and correlation of coal seams in West Bokaro Coalfield has been finalised and seven palynozones have been identified belonging to various formations of the Lower Gondwana sequence of West Bokaro Coalfield, viz., Zone-I—Talchir Formation, Zone II and Zone III—

Karharbari Formation, Zone IV—Lower Barakar Formation, Zone V—Upper Barakar Formation, Zone VI—Barren Measures, and Zone VII—Raniganj Formation.

Besides, the sudden displacement of these zones and their coming in contact with the older or younger zones have also been traced out in space and time. The disposition of various rocks has indicated a possible synclinal nature of West Bokaro Basin which is also superimposed by small sub-basins.

Rakesh Saxena

Subproject : Palynological studies of Raniganj coals, West Bengal

The charts and histograms showing palynological assemblage recovered from bore-hole samples of 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 were prepared. A manuscript on palynological and petrological study of these bore-holes is being finalised.

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

Project : Biopetrology of Indian coal deposits

Objective : Evaluation of coals for classification and utilization

Subproject : Biopetrology of the Lower Gondwana coals of Raniganj Coalfield, West Bengal

Several preliminary plottings utilizing biopetrological and rank data of Raniganj coal samples (sent by C. M. P. D. I., Ranchi from bore-holes—C. M. P.-304/G.R.T./OV/79 ; C. M. P.-302/D. M. M./OV/79 and M. E. C.-296/S. S./OV/79) were prepared for evaluation and correlation of the coal seams represented by the samples studied.

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

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

All the coal samples of Barakar Formation representing the three bore holes, viz., CMPJ14, Parej Block and CMK107, Kedla Block belonging to northern part of West Bokaro Coalfield and CMKJ21, Banwar Block of southern part were petrologically studied. These coals have also been evaluated considering their maceral, microlithotype, mineral matter and rank characteristics. It has been concluded that they are medium volatile to high volatile bituminous coals. The abnormal behaviour of rank in space and time has been referred to the possible intrusives and tectonic activity of the area. These results have been included in a Ph.D Thesis.

G. K. B. Navale and Rakesh Saxena

Subproject : Mineral characteristics of Gondwana coals

Eighteen pellets belonging to western most part of the Bokaro Coalfield have been prepared, out of which 8 pellets were microscopically studied to depict the typical relation of various minerals with coal ingredients.

G. K. B. Navale and Rakesh Saxena

Subproject : Biopetrological studies of Ramgarh Coalfield, Bihar

Recently collected bore-core and quarry samples have been crushed and pellets have been prepared for the above study.

G. K. B. Navale and Rakesh Saxena

Subproject : Biopetrological studies of the Lower Gondwana coals in Singrauli Coalfield, Madhya Pradesh

Quantitative assessment of 35 coal pellets from working faces have been completed. Compilation, calculation and tabulation

of maceral and microlithotype data of these samples have been carried out. Microphotographs of some microconstituents were taken. Reflectance measurements were made on 40 coal pellets from bore-hole no. NCSM-3 drilled in Moher Block. Fortytwo coal samples from bore-hole no. NCSJ-4 of Jhingurdah area were crushed, sieved and particulate pellets were prepared in exposy resin for biopetrological studies.

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

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

The maceral, microlithotype and reflectanoe studies of 23 coal samples from the Giridih Coalfield, Bihar have been completed. A manuscript on biopetrology of Giridih coals is under preparation.

Anand Prakash

Subproject : Biopetrology of Lower Gondwana coals from Kameng area, Arunachal Pradesh

Nine particulate coal pellets were prepared from Kameng coal samples. Reflectance measurements along with preliminary assessment of the organic microconstituents were also carried out on all these pellets. The study indicates that these Lower Gondwana coals are highly crushed and rendered semianthracitic in nature due to intense tectonic activity in the area.

M. Ahmed, B. K. Misra and G. K. B. Navale

For biopetrological studies 11 more particulate pellets from coal samples of Kameng area, Arunachal Pradesh were prepared.

B. K. Misra and S. C. Srivastava

Subproject : Biodiagenetic study of coaly and carbonaceous bands of the Lower Gondwana sediments from Palar Basin, South India

Six particulate pellets of samples from thin coal bands from Palar Basin, South India were prepared and polished. Maturation studies conducted on these pellets indicated that they have attained a rank of sub-bituminous to high volatile bituminous C stage.

Three particulate pellets of samples from carbonaceous bands lying below the above coaly band were also prepared for biodiagenetic study.

B. K. Misra and Suresh C. Srivastava

Subproject : Biopetrology of Mesozoic coals of Kachchh, Gujarat

A manuscript on the nature of microconstituents, maceral and microlithotype composition and maturation of coals from Kachchh, Gujarat is being finalised.

Anand Prakash

Subproject : Fluorescence microscopy of Indian coal deposits

To investigate the nature and distribution of hydrogen-rich fluorescencing organic microconstituents 30 coal and lignite pellets from the Palaeozoic and Cenozoic horizons of India were studied under fluorescence light. About 10 coal pellets of foreign coal samples were also studied for comparison with the Indian samples.

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

Subproject : Classification of Indian coal deposits

Modification in Prof. Alpern's (1981) Universal Classification of solid fossil fuels was undertaken. Restructuring of the classi-

fication model and plotting of large number of biopetrological and rank data from the Indian coals were done. A revised manuscript after incorporating Prof. Alpern's personal suggestion has been submitted for publication.

A paper dealing with the prospect of utilizing vitrinite/inertinite ratio in distinguishing Karharbari, Barakar and Raniganj coals is being finalised after the selection of final illustration model.

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

Subproject : Geochemical analysis of the Indian coal deposit

Chemical analysis (proximate analysis) of 3 lignite samples from the Neyveli Lignite Field has been completed.

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

Subproject : D.O.M. studies of sedimentary rocks

To study the maturity index of organic remains of the various sedimentary rocks 10 samples have been processed.

Anand Prakash and Rakesh Saxena

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

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

Subproject : Palynostratigraphy and petrology of Neyveli lignites (Miocene), Tamil Nadu, South India

Thirteen samples from IInd Lateral Section 1125/2375 were remacerated by Staplin's Standard method but all proved barren. Macerated total 83 samples from Neyveli and 3 samples from bore-core no. MO/7 (Barren). 33 samples from bore-core NLE-36

(only 10 samples yielded); 29 samples from bore-core NLE-36 (6 samples yielded); and 18 samples from bore-core NLE-27 (all barren). All the samples were preserved, both before and after oxidation. About 68 slides of yielded samples were prepared and scanned. Photographs of some specimens were taken and printing was also done. Rough plates of the pollen-spores were made. The description of studied miospores from 1st Lateral Section 500/2125, 1st A Lateral Section 775/2275, bore-core NLE-36, and from bore-core NLE-35 were completed.

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

Out of 5 particulate pellets of lignite samples from bore-hole EV/26 of New Mine area, Neyveli Lignite Field the three pellets were quantitatively assessed for their microconstituents along with rank determination.

Three particulate pellets from a bore-hole (MO/7) and 20 particulate pellets from another three bore-holes (NLE-27, NLE-35 & NLE-36) of New Mine area, Neyveli Ligeite Field were prepared for biopetrological and maturation studies.

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

Subproject : Biopetrology and maturation study (D. O. M. lignite) of Panandhro lignite seam and associated sediments from Kachchh, Gujarat

About 52 Panandhro lignite and associated sedimentary rock samples were crushed, sieved and particulate pellets were prepared for biopetrological and dispersed organic matter (DOM) studies.

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

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 archaeological samples*

Kumaon—Three sediment samples at depths of 0.85 m, 3.85 m and 4.35 m from Parsuram Tal were dated to 680 ± 110 yrs., 2830 ± 120 yrs. and 2885 ± 125 yrs. respectively. An average sedimentation rate of 1.2 mm/years derived from these dates agrees well with those obtained for other lakes (Ram Tal, 1 mm/year and Naukuchiya Tal, 0.6—1.8 mm/year) of Kumaon region.

Assam—A sample from Brahmputra Basin in Upper Assam has been dated to 15770 yrs. B. P.

Himachal Pradesh—Peat and carbonaceous samples pertaining to neotectonic movement along the outer Himalayan thrust/fault planes (Krol thrust) have been dated to 20660±450 yrs, 28100± 1850 yrs and 40,000 yrs.

Madhya Pradesh—Radiocarbon dating of sediment profiles from Amagaon and Chhui Tingi have shown that at Amagaon the profile of 1 m depth is only 1200 yrs. old. A sedimentation rate of 0.2 mm/year is derived for the profile at Chhui Tingi.

Miliolites—Eleven samples of miliolites from Saurashtra coal were dated to understand the effects of contamination of modern carbon in these formations. The age of the samples vary from 12600 yrs. to 40,000 yrs.

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

Project : *Fission track dating*

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

Annealing studies—A systematic study of fission track annealing characteristics is essential for correcting the age of mineral which might have gone through annealing in the geological past. This study was taken up for one of the most abundant and common authigenic sedimentary mineral—glauconite. Investigations of annealing at temperatures of 400°C, 350°C, 300°C clearly indicated that the mineral has a very low annealing temperature. Hence, detailed study was carried out at 90°C, 120°C, 150°C, 180°C and 210°C. It was also observed that a marked change in mineral colour was brought about by heating and higher temperatures even for an hour. The results of annealing studies indicate that glauconite will get annealed if the temperature rises above 50°C during its geological age. The retention of original green colour of the mineral is also a clear indication that the mineral has not been annealed.

Dating—Fission track dating work on glauconite from peninsular India and on apatite and kyanite from north-west Himachal Himalaya was carried out as follows:

Glauconite—Dating of eight glauconite samples from three different sedimentary formations varying in ages from Oligocene to Pre-Cambrian have been carried out. In all cases F-T ages agree very well with the geological ages of the strata based on other studies. As the track annealing correction to these ages is negligible, they directly refer to the actual age of deposition for the formations. This study has confirmed that glauconite is suitable for dating by F-T method and establishes a first step to date directly the sedimentary deposits of widely differing ages.

Eleven glauconite samples from Machalmara Section of Semri Group sediments of Chopan area in Mirzapur were taken up for F-T dating. These samples have been scanned for fossil tracks and sent to B.A.R.C. for neutron irradiation.

Apatite—Dating of granites, pegmatites and associated rocks was done by making measurements on in-situ apatite grains in thin sections. Twentytwo samples have been dated from north-west Himachal Himalaya. The ages vary from 6 to 20 Ma and are in good agreement with the earlier data. These have helped to confirm the dating of movements along thrust and fault zones in the Himalaya.

Kyanite—A report on the annealing characteristic studies on Kyanite and dating of some samples from Himalaya was prepared and submitted for publication.

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

Research in Collaboration

Delhi Supergroup

A paper on "Microbiota from the Kushalgarh Formation, Delhi Supergroup" was submitted for publication. The microbiota comprises coccoidal and filamentous blue green algae belonging to 9 genera and 14 species. Of these, two genera are new (with G. S. I. Northern Circle).

Precambrian-Cambrian Boundary

Cyanophycean algae, viz., *Myxococcoides*, *Sphaerophycus*, *Palaeoanacystis*, *Gunflintia*, *Siphonophycus*, *Eomycetopsis* and *Ghoshia* have been recorded from Shundi Lada and Wanner sections of Lolab Valley, Kashmir. Besides, in Wanner Section cryptarchs belonging to Sphaeromorphitae and Polygonomorphitae have been identified (with G. S. I., Northern Region, Himalayan Geology Division, IGCP-29).

Permo-Triassic boundary in Damodar Basin

Study of bore-cores from Damodar Basin was continued (with G.S.I., Coal Division).

Bokaro Coalfield

Gondwana rocks of the Bokaro Coalfield were being analysed (with Coal India Ltd., Ranchi).

Gondwana of Arunachal Pradesh

The study of sporae dispersae of the Lower Gondwana sediments in Siang and Kameng districts of Arunachal Pradesh was continued (with Dibrugarh University, Dibrugarh).

Palynology of the Mesozoic sediments of Kachchh Basin

A number of samples collected from the Kaladongar Formation exposed in Kunverbet Island were chemically processed for organic walled microfossils. All samples proved to be unproductive (with Institute of Petroleum Exploration, Oil & Natural Gas Commission, Dehradun).

Plant megafossils from Lower Gondwana of eastern Himalayas

The genus *Glossopteris* has been identified from Arunachal Pradesh and Sikkim. Interesting specimens have been photographed (with Wadia Institute of Himalayan Geology, Dehradun).

A treatise entitled "Elucidation of Mesozoic Cycadophytes" was continued (with Department of Botany, University of Texas, Austin, U.S.A.).

Biopetrological and maturation studies of Kameng coals from Arunachal Pradesh were continued (with Geology Department, Gauhati University, Assam).

Malla Johar, District Pithoragarh

A check list of miospores and dinoflagellate cyst taxa with their distribution chart has been prepared. Out of these, 7 species of dinocysts are new. Biozonation scheme based on dinocysts has been proposed. The age of the Spiti Shale has been assessed to range from Oxfordian to Tithonian (with Geology Department, Lucknow University).

Cauvery Basin

Dinocyst biozonation of well cutting samples of Karaikal Well no. 9 was completed. Photodocumentation and distribution chart of significant taxa were prepared (with Oil & Natural Gas Commission, Dehradun).

The work on nannoplankton biostratigraphy of well cutting samples of Karaikal Well no. 9 was completed and a report together with a table showing proposed zones covering 2,400 meters of well depth was sent to O.N.G.C., Dehradun. High potential of hydrocarbon was indicated for the Late Eocene to Middle Oligocene time slices (with Oil & Natural Gas Commission, Dehradun).

Tertiary of Kachchh and Rajasthan

Sample for nannoplankton studies were examined from the different Tertiary sections of Kachchh and Rajasthan area. The presence of detable nannoflora was demonstrated from Rajasthan area. Light and scanning electron microscopic documentation of the nannoflora from Kachchh area were continued (with G.S.I., Western Region, Jaipur).

Mesozoic of Kachchh Basin

In order to evolve a working model for the occurrence of barren and plankton productive horizons in the Mesozoic of Kachchh area, a section of Ler Village was closely sampled and studied in detail, incorporating sedimentologic and nannoplankton data. The basin represents upper part of the Jhumara Forma-

tion. The sediments were deposited in extremely shallow, coastal setting with periodic influx of plankton from the open sea. A paper has partly been completed (with Geology Department, Lucknow University, Lucknow).

Kachchh Basin

Samples of Mesozoic rocks of Kachchh area were collected for detailed palynological studies. Detailed sampling was done in Jhumara Dome area (Jhurio & Jhumara formations) and Pacham Island (Kaladongar & Goradongar formations) (with Oil & Natural Gas Commission, Dehradun).

Miocene-Pliocene sediments from Assam

Samples belonging to both Miocene and Pliocene from Assam yielded *Lygodiumsporites*, *Osmundacidites*, *Striatriletes*, *Podocarpidites* and *Malyacearumpollis*. On the basis of *Striatriletes* and *Podocarpidites* it was observed that the Miocene sediments could be differentiated from Pliocene (with Dibrugarh University, Dibrugarh).

Oceanic cores

The dinoflagellate cysts and acritarch assemblage recovered from five sediment cores (45 samples) nf the Arabian Sea are represented by 22 species belonging to 15 genera. Out of which one acritarch genus, viz., *Ornatasphaera* and 3 species are new. The distribution of various species in different cores has been discussed. The assemblage has been compared with some other known Quaternary assemblages. A paper on this study was finalized and submitted for publication (with National Institute of Oceanography, Goa).

Study of a fossil dicotyledonous wood from the Tertiary of Ladakh (Jammu & Kashmir) was continued (with Wadia Institute of Himalayan Geology, Dehradun).

The identification of the fossil woods from the Tertiary of Zaire was confirmed with *Copaefera*, *Manilkara*, *Byrsocarpus*, *Albizia*

and *Cynometra* (with Museé Royal, de l' Afrique Centrale, Tervuren, Belgium).

A manuscript describing "A petrified palm wood from the sea coast of Vitte-Heddensee, East Germany", was prepared, (with Museum Naturkunde, Humboldt Universitat, East Berlin).

Kashmir

A paper on diatom analysis: Hirpur Loc. III (Lower Karewa) was completed and submitted for publication. Another paper on palynostratigraphy and palaeoenvironments of Kashmir: Hirpur Loc. III, Lower Karewa was also finalised. The pollen diagrams for Dubjan, Hirpur Loc. I, Ningle Nullah and Kachipathra all in Lower Karewa have been constructed (with Physical Research Laboratory, Ahmedabad).

Son Valley, Madhya Pradesh

The base of the Kunjan River Section, from organic matters from dark clay and the shells below the clay, has been dated to 3320 ± 175 yrs. and 4200 ± 110 yrs. B. P. (BS—382 & BS—377) respectively (With Department of Archaeology, Allahabad University and Department of Anthropology, California University, California).

Oceanic cores

The work on the recent oceanic sediments from the Arabian sea (17th & 18th Oceanic Cruise of R. V. Gaveshani, NIO, Goa) has been completed. The modern spectra have revealed a mixture of local and extraregional pollen grains and selective transport of pollen/spores with the increasing off-shore distance. Pollen grains of Rhizophoraceae, Chenoams, *Artemisia, Pinus, Picea* and *Abies* have been found concentrated in the off-shore distant samples. The clastic sediments have been found rich in pollen/spores than the coarse-grained ones.

Twenty deep sea sediments (86th Oceanographic Cruise of R. V. Gaveshani, NIO, Goa) have been found unproductive (with National Institute of Oceanography, Goa).

Birbal Sahni Research Scholars

Project : Geochemistry of Tertiary fossil wood and its associated rocks

During a reconnaissance field survey of the Kalagarh area (Siwaliks), Dehradun District, several traverses were taken along and across the area in order to decipher the lithological variation. Due to thick vegetation, and highly altered outcrop, only a few fossil wood specimens could be collected. In the laboratory, infra-red spectroscopy has been applied for the first time to decipher the mineralogy of the fossil wood on an experimental basis; the samples were run in the wave-length of 4000 cm^{-1} to 400 cm^{-1}. Attempts are in progress to improve the technique in order to have better reproduceable data.

The Lower Siwaliks exposed between the Ramganga and Kosi rivers of Uttar Pradesh has acquired significance with the discovery of an ossiferous horizon with the sub-graywacke lithologic unit. The preliminary studies have shown that the ossiferous horizon most likely represents an Upper Chingi age. Structurally the area has been subject to folding and faulting, and in north of the Ramganga reservoir the Siwalik rocks are thrusted over by the Krols. Towards the south, along the foot-hill, a subrecent thrust has been identified as the Kalagarh thrust, which has brought the Lower Siwaliks over the subrecent terrace deposits.

The rocks near the dam site belong to the middle Siwalik formations, constituting alternate beds of soft and friable clay

shales and sandy rocks with some transitional siltstone. The strike trend of the bed is N 60° W, S 60°E direction and the amount of dip varies from 30°—40° towards NE.

Rajiv Vimal

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

Typical peat bog deposits are hardly to be found in eastern and north-eastern India, probably because this part of the country had never been glaciated. In view of this lacuna a series of Quaternary surface and subsurface samples were collected from the shallow beds of Loktak Lake and adjoining areas. Loktak Lake is now in the process of transformation into a reservoir as a result of the implementation of a big hydro-electric project.

Five profiles including 135 samples were systematically collected which partially yielded fossil pollen grains, in some cases in good frequency and preservation.

A total of 50 samples have already been processed for palynomorphs. The fossil grains have been identified on the basis of the study of extant flora. The dominant types include spores of various fern species, pollen grains of Poaceae, Cyperaceae, Rhamnaceae, Fabaceae, Myrtaceae, Sapindaceae, Acanthaceae, Asteraceae, etc.

Partha Roy

Project : Tertiary flora of India

Thin ground sections of silicified cherts of Deccan Intertrappean beds have been made and studied. One of them shows a

well-preserved monocot root, probably of a graminaceous plant. Monocot roots are quite common in these rocks but to the occurrence of a graminaceous root is interesting.

Besides, a few macerated samples of Tertiary coal of Malaya have also been examined for microfossils. In these samples, fungi are commonly met with, besides pollen grains and spores. Some fungal fruiting bodies have been studied in detail and a few of them have been identified. Sections of many petrified axes have been prepared. Their identification and detailed studies are in progress.

R. K. Srivastava

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

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

The structure and ontogeny of stomata occurring on fronds of a large number of Cyatheaceae (sensu Holttum & Sen, 1961) have been investigated. Six sharply defined forms of adult stomata—polocytic, copolocytic, anomocytic paracytic, coparacytic and hemiparacytic (the last two newly discovered) have been recognised within the family. The stomatal meristemoids in all the six types pass through an identical 2-celled condition and then follow one of the four main pathways of development. Though the cells surrounding the mature stomata of the polocytic, copolocytic, anomocytic and hemiparacytic types vary considerably in aspect and orientation, it is significant that in all these forms they are of dual origin (i.e. mesoperigenous). One of more of the surrounding cells are derivatives of the stomatal meristemoid, while others are derived independently from it. Interestingly, the paracytic and coparacytic types of stomata which are mesoperigenous in origin have ontogenetically been

derived from hemiparacytic type of stomata, which itself is mesoperigenous in origin.

The structural significance of the stomatal types in relation to the phylogenetic problem associated with these ferns has also been indicated.

Surajit Chakravorty

Theses Submitted

A. Bhattacharya	Studies in the vegetational history of the alpine region of north-west Himalaya
Rahul Garg	Stratigraphy and micropalaeontology of the Mesozoic rocks exposed around Jaisalmer, Rajasthan
B. K. Misra	Palyno-petrostratigraphy of the Tertiary coals from Makum Coalfield, Upper Assam
P. K. Pal	Contributions to the Triassic flora of Madhya Pradesh and Jurassic flora of Rajmahal Hills
Bijai Prasad	Contribution to the stratigraphy and palaeobotany of the Lower Gondwana formations of the Rajmahal Hills, Bihar
M. R. Rao	Palynostratigraphy of Tertiary sediments of Sonapur-Badarpur road sections, Lower Assam
Samir Sarkar	Contribution to the palynology of Tertiary sediments of Himachal Pradesh, India

Rakesh Saksena	Palynostratigraphical and petrological studies of coals from West Bokaro Coalfield, Bihar, India
Aruna Sharma	Further contributions to the palaeobotanical history of crops
S. K. M. Tripathi	Contribution to the Tertiary palynostratigraphy of Assam
Ram Ratan	Studies on petrified woods from Siwalik beds and palynology of oceanic sediments from the western coast of India

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Field Work

1. Stromatolites and palynological samples from Calc zone, Pithoragarh and Tejam, Uttar Pradesh were collected. (P. K. Maithy, Manoj Shukla and K. L. Meena).

2. Organosedimentary structure and palynological samples from Vindhyan Supergroup around Maihar and Chitrakoot have been collected (P. K. Maithy, Rupendra Babu and K. L. Meena).

3. Plant megafossils and samples for bulk maceration were collected from the Hura, Gumani and Brahmini tracts of Rajmahal Hills, Bihar (H. K. Maheshwari).

4. Plant megafossils have been collected from the Lower Gondwana exposures of Rajmahal Hills, Bihar (Bijai Prasad).

5. Plant megafossils and samples for bulk maceration were collected from the Barakar and Raniganj formations of Raniganj Coalfield, West Bengal (H. K. Maheshwari, A. K. Srivastava, Usha Bajpai and K. J. Singh).

6. Plant megafossils were collected from the Upper Permian exposures near Handappa, Dhenkanal District, Orissa (A. K. Srivastava and K. J. Singh).

7. Plant megafossils and palynological samples have been collected from various Mesozoic localities in Gujarat and Rajasthan (M. N. Bose and J. Banerji).

8. Plant fossils from various Jurassic localities of Rajmahal Hills, Bihar have been collected (P. K. Pal).

9. Plant megafossils and samples for bulk maceration have been collected from various Mesozoic localities in South Rewa, Satpura, Pranhita-Godavari basins and East Coast of India (Sukh-Dev, Rashmi Srivastava, A. Rajni Kanth and Neeru Pandya).

10. Bore-cores as well as out crop samples were collected from the Rajmahal region and Raniganj Coalfield. (R. S. Tiwari and K. L. Meena).

11. Collection of bore-cores from the Singareni Coalfield was done (Suresh C. Srivastava and Neerja Jha).

12. Samples from the Lower Gondwana sediments from Birsinghpur Pali and Satpura Gondwana Basin have been collected for palynological studies (Suresh C. Srivastava, Anand Prakash, Ram Awatar and O. S. Sarate).

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

14. Rock samples of the Tertiary age were collected from Port Blair, Baratang, Havelock, John Lawerence and Peel areas of the Andaman Islands for palynological studies (R. K. Kar).

15. About one thousand rock samples of the Upper Cretaceous Palaeocene and Eocene age were collected from various localities of Khasi and Jaintia Hills for palynological studies (R. K. Kar, R. S. Singh, Madhav Kumar and B. D. Mandaokar).

16. About one thousand rock samples from Upper Cretaceous to Miocene horizons were collected from various localities of Upper Assam (R. S. Singh, Madhav Kumar and B. D. Mandaokar).

17. A field excursion was undertaken to study the stratigraphy of the rock formations and collection of rock samples for palynological investigation from (*i*) Middle Siwalik sediments of Hardwar and Mohand areas in Saharanpur District of Uttar Pradesh ; (*ii*) Upper Siwalik sediments of Panchkhula, Pinjor, Masol, Kiratpur and Sirsa Nadi Section in Ambala District of Haryana ; (*iii*) Middle Siwalik sediments of the Hari Talyangar areas in Bilaspur District of Himachal Pradesh ; (*iv*) Kasauli sediments exposed along Kalka-

Simla Road near Barog in Solan District of Himachal Pradesh; (*v*) Subathu sediments from 9 different localities of Solan District, Himachal Pradesh (H. P. Singh, R. K. Saxena, S. K. M. Tripathi, Samir Sarkar and A. P. Bhattacharya).

18. Rock samples from the measured Jurassic sections of western Kachchh and Pachcham Island areas have been collected to work out spore-pollen, dinoflagellate cysts and nannoplankton analysis (K. P. Jain, H. K. Maheshwari, S. A. Jafar, R. Garg, K. Ateequzamman and R. Saxena).

19. Coal samples were collected from Bokaro, Ramgarh and Jharia areas (G. K. B. Navale and Rakesh Saxena).

20. An excursion to Singrauli Coalfield, Madhya Pradesh was undertaken for the collection of bore-hole samples and geological studies (B. K. Misra and B. D. Singh).

21. For petrological and geological studies a number of coal and shale samples from Satpura Basin have been collected (Anand Prakash and O. S. Sarate).

22. Megafossils both of leaves and woods were collected from various Palaeogene and Neogene localities of Meghalaya and Assam (K. Ambwani).

23. Leaf-impressions and carbonised and petrified woods were collected from various Tertiary localities of the Kerala coast, Neyveli lignite mines and from near Pondicherry in South India (N. Awasthi, Madhu Panjwani and Anil Agrawal).

24. A good collection of petrified woods was made from various Neogene localities in the vicinity of Shantiniketan, Sriniketan, Labpur and Mohammad Bazar of Birbhum District in West Bengal (M. B. Bande).

25. Megafossils consisting of fossil woods and other petrified plant remains were collected from Nawargaon in Wardha District, Ghughua and other Tertiary localities of Mandla District (M. B. Bande and R. C. Mehrotra).

Group Discussion

Isotopic stratigraphy, magnetostratigraphy, plate tectonics and biostratigraphy—A new synthetic approach for palaeobiology and palaeoenvironmentology—Vishnu-Mittre (Convener), G. Rajagopalan, H. P. Singh, R. S. Tiwari and Anand Prakash.

Highlighting the importance of biostratigraphy in the understanding of origin, evolution, migration, diversity, competitive strategies and massive extinctions, etc. of plant and animal life in the background of environmental fluctuations, the penalists, by selecting case histories, drew attention to other parameters used in building up stratigraphy such as isotope stratigraphy, magnetostratigraphy and plate tectonics, and urged that a synthetic approach should be adopted to have a fuller knowledge of the past.

The O^{18} isotope studies in space and time have provided an independent parameter for the past fluctuations in temperature. The magnetostratigraphy time-scale has helped in determining palaeolatitudes. It is also largely believed that mass genetic changes resulting in proliferations and mass extinctions in past plant and animal life had most likely occurred during periods of reversals more particularly during several short term reversals which had occurred in quick succession. Further the reconstruction of palaeoclimatic maps based upon palaeolatitudes have advanced our knowledge of past climatic regimes. For instance, it has been discovered that all the glaciated areas during the Pre-Cambrian were situated in the tropics. The climatic evolution has been in the background of continental drifts as

variations in radiation of the sun are directly related with sea and land level changes, thus the climatic function is always with respect to latitudes. Much of this information on the disposition of the continents in different palaeolatitudes and their rifting and rafting into the others is provided by the Plate Tectonics Theory based upon palaeomagnetic studies. Apart from providing evidence of past climatic changes, the information it provides on variable distribution of habitational area, fluctuations in sea level by plate motion and on changing land and ocean barriers, it is directly related with the evolution of plant and animal life.

The additional information, these new parameters provide to biostratigraphy, comprises dating and causes of massive proliferations and extinctions by magnetostratigraphy; climatic fluctuations by isotope stratigraphy, magnetostratigraphy and plate tectonics and various aspects of biological evolution by plate tectonics, isotope stratigraphy and magnetostratigraphy. Thus, the new approach should be towards the synthesis of these new parameters for a fuller knowledge of the factors governing the distribution and evolution of flora and fauna.

It has also been proposed that this synthetic approach could be extended for future climates, and for the bio-ecological aspects of the strategies role of the biosphere, lithosphere and atmosphere in the past and future human history at this crucial stage when we are confronted with problems of pollution of water and air and there is tendency towards rise in temperature which may threaten human existence in the near future.

Papers read at Symposium/Conferences/ Meetings, etc.

D. P. Agrawal, D. K. Bhatt, B. S. Kotlia, R. Dodia, S. Kusumgar, Ashok Sahni, R. K. Pant, H. P. Gupta and A. B. Vora—*Bio-*, chrono—and magnetostratigraphic correlations of the Kashmir Karewas.

N. Awasthi & J. S. Guleria—Plant megafossils from the Lower Karewa of Kashmir. Workshop on Late Cenozoic Palaeoclimatic changes in Kashmir and Central Asia, Physical Research Laboratory, Ahmedabad.

Usha Bajpai & Hari K. Maheshwari—Application of Scanning Electron Microscope in the study of Indian Gondwana Plants. XV Annual Conference of Electron Microscope Society of India, Varanasi.

R. Dodia, H. P. Gupta, C. Sharma and A. B. Vora—Palynostratigraphical data from the Holocene bog-cores from Kashmir. Workshop on Late Cenozoic palaeoclimatic changes in Kashmir and Central Asia, Ahmedabad.

H. P. Gupta & Asha Khandelwal—Diatom analysis of Hirpur Loc. III (Lower Karewa). Workshop on Late Cenozoic palaeoclimatic changes in Kashmir and Central Asia, Ahmedabad.

H. P. Gupta, Chhaya Sharma, Rekha Dodia, Chetna Mandavia & A. B. Vora—Palynostratigraphy and palaeoenvironments of Kashmir, K. Hirpur Loc. III, Lower Karewa. Workshop on Late Cenozoic palaeoclimatic changes in Kashmir and Central Asia, Ahmedabad.

H. P. Gupta, Chhaya Sharma, C. Mandavia and R. Dodia—Palynostratigraphy and palaeoenvironments of Dubjan, Lower Karewa, Kashmir. Workshop on Late Cenozoic palaeoclimatic changes in Kashmir and Central Asia, Ahmedabad.

H. P. Gupta, Chhaya Sharma, Rekha Dodia, D. P. Agrawal and R. K. Pant—Pollen analytical results from Wapjan (Upper-Lower Karewa), Kashmir. Workshop on Late Cenozoic palaeoclimatic changes in Kashmir and Central Asia, Ahmedabad.

S. A. Jafar—Nannoplankton evidence of Turonian transgression along Narmada Valley, India. X Indian colloquium on Micropalaeontology and Stratigraphy, Pune.

H. K. Maheshwari & B. N. Jana—Cretaceous spore-pollen complexes from India. Symposium on 'Cretaceous of India: Palaeoecology, Palaeogeography and time boundaries', Lucknow.

G. Rajagopalan, A. P. Srivastava & H. S. Saini—An attempt to date fossil woods by F-T method. Third National Seminar-cum-Workshop on SSNTDs G.N.D. University, Amritsar.

H. S. Saini, A. P. Srivastava & G. Rajagopalan—Annealing of fission tracks in glauconite. Third National Seminar-cum-Workshop on SSNTDs, G.N.D. University, Amritsar.

A. P. Srivastava, H. S. Saini & G. Rajagopalan—Application of F—T technique to date glauconite. Third National Seminar-cum-Workshop on SSNTDs GND University, Amritsar.

H. P. Singh & Samir Sarkar—Significant palynozones of the Subathu Formation (Himachal Pradesh) and their bearing on stratigraphy. Symposium on Frontiers of palaeontological and stratigraphical research, Calcutta.

Vishnu-Mittre, Chhaya Sharma, A. K. Saxena, Kamla Prasad & A. Bhattacharya—Pollen stratigraphy of India. International seminar on "Archaeological perspectives of India since Independence", New Delhi.

Vishnu-Mittre—Management of natural and man-made forests and comparative analysis: at the seminar "Strategies for environmental management" organised by U. P. State Deptt. of Science and Environment, NBRI, Lucknow.

Lectures given outside the Institute

K. P. Jain—Introduction to micropalaeobotany and its significance in geologic exploration. Four extension lectures at the Department of Geology, Delhi University, Delhi.

K. P. Jain—Introduction to micropalaeobotany and its significance in geologic exploration. Four extension lectures at the Department of Earth Science, Roorkee University, Roorkee.

G. Rajagopalan—"Dating methods for ancient materials". Two lectures given at the UNESCO sponsored training course on 'Conservation of Cultural Property'.

Training Provided to Outsiders

Shrimati Anisha Dhar (Department of Botany, Gujarat University, Ahmedabad) was imparted training on plant megafossil studies.

Mr. Bajrangi (Department of Geology, Banaras Hindu University, Varanasi) was given training in the study of microbiota from Vindhyans around Susani.

Mrs. Gail E. Wagner (Department of Anthropology, University of Pennsylvania, U. S. A.) was imparted training in archaeobotany.

Technical Assistance to Outsiders

1. Central Mining, Planning and Designing Institute of Coal India Limited, Ranchi

Biopetrological and rank evaluation of 36 coal samples from Raniganj Coalfield (from three bore-cores) have been done.

2. Neyveli Lignite Corporation

Biopetrological and rank evaluation of bore-hole samples from New Mine area, Neyveli Lignite Field were carried out.

3. Geological Survey of India

Several bore-cores from Godavari Coalfield (Ramagundum & Manuguru areas) have been dated palynologically for the identification of the Kamthi Formation.

Bore-core samples from the East Raniganj Coalfield and Rajmahal area have been dated palynologically and Permo-Triassic boundary has been marked.

4. Coal India

Upper Permian sediments (Raniganj-Barren Measures) have been dated palynologically in sub-surface sediments of West Bokaro Coalfield.

5. Archaeological Survey of India, New Delhi

Charcoal samples from excavation sites at Gufkral (Kashmir), Dwelling pits in Burzahom (Kashmir), Ramapuram (Andhra Pradesh) were dated.

6. Geological Survey of India, Lucknow

Quaternary sediment samples (wood, peat, organic clay, carbonaceous material) from Himachal Pradesh, Tripura and Haryana were radiometrically dated.

7. Bose Institute, Calcutta

One sandy clay with lignite sample from Digboi was dated.

8. Atomic Minerals Division, Hyderabad

Carbonate concretions from bore-holes in I.I.T. Campus, Kanpur were dated.

9. Deccan College, Pune

Shell and wood samples from Akhoni, Bhingaon, Gas Village and Nala Gopura in Maharashtra State were dated. Charcoal samples from archaeological sites, Naikhund and Kairwada, Maharashtra have been dated.

10. Punjab University, Department of Ancient Indian History, Culture and Archaeology, Chandigarh

Charcoal samples from Singh-Bhagwantpur were dated.

11. University of Paris, France

Information on pollen analytical and geomorphological data and on literature concerning the Kathmandu Valley, Nepal was given.

12. Institution of Archaeology, London

Information on the literature on fibres was provided.

13. Archaeological Survey of India

The investigations on the archaeological material were continued.

14. Society for Environmental Archaeology, Lucknow

General information on palynology, palaeoclimates and antiquity of rice was given.

15. State Archaeology, Govt. of Manipur

Information on geomorphology was provided.

Deputation/Training/Study Abroad

M. N. Bose—Visited Federal Republic of Germany and Oslo on special invitation from the Deutscher Akademischer Austauschdienst and Professor S. B. Manum of Institut for Geologi, Universitet i Oslo from 1st April, 1982 to 23rd April, 1982.

H. P. Gupta—Deputed to G. D. R. from June 8, 1982 to July 29, 1982 where he visited several museums on Natural History and Archaeology in Berlin, Potsdam, Halle; Botany Departments of Humboldt University, Berlin, Martin Luther University, Halle, and Research Institutes and Labs on Archaeology, Limnology, etc. and undertook field excursions. Under the auspices of the British Council visitorship, he also visited the Botany Department of the London, Cambridge and Glasgow Universities and Department of Geography of Liverpool University.

Publication & Information Section

Publication

During the year numbers 1, 2 and 3 of Volume 30 of '*The Palaeobotanist*' were printed. Besides, the manuscripts of all the three numbers of next Volume 31 were also processed and sent to Press for printing. The blocks of these issues have also been supplied to the printer.

The twelfth Birbal Sahni Memorial Lecture "What is Palaeobotany for?" by Professor T. M. Harris and the tenth Silver Jubilee Commemoration Lecture "Palynology in oil exploration" by Shri S. N. Talukdar were printed. The eleventh Birbal Sahni Memorial Lecture "Status and position of hornworts" by Dr R. S. Chopra and the thirtieth Sir Albert Charles Memorial Lecture "Palynology, organic petrology and petroleum—A palaeobotanist's view" by Dr Swein B. Manum were also processed and the manuscripts were sent to Press.

Both Hindi and English version of the Annual Report for the year 1981-82 were compiled and published and also sent to various colleges, institutions and universities.

During the period under review an income of Rs. 75,140.62 was registered from the sales proceeds of the Institute publications. This sum includes the following foreign exchange earnings.

US $ = 1,616.60

£ = 396.90

Library

1. *Stock:*

No.	Details	Position on 31.1.1982	Additions during 1982-83	Total
1.	Books	3670	78	3748
2.	Journals	7207	437	7644
3.	Reprints	27709	663	28373
4.	Microfilms/fiche	247	21	268
5.	Thesis	38	1	39
6.	Reports	44	1	45
7.	Maps and Atlas	45	—	45
8.	Reference Books	125	26	151

In addition to this 85 current periodicals were also subscribed.

Total number of registered borrowers = 129

2. *Exchange Programme:*

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

(*ii*) Total number of reprints sent out on exchange 6101

(*iii*) Number of Institutions on exchange .. 75

(*iv*) Number of Individuals on exchange .. 426

(*v*) Sets of papers of Professor Birbal Sahni distributed 4

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

(*vii*) Sets of Institute publications (formerly priced) distributed 47

3. *Current Awareness Service:*

The monthly list (quarterly since July '82) of new additions to the Library, e.g. books, reprints and journals as well as titles called from the journals was continued in order to keep readers in touch with the latest aquisitions. A copy of each issue was distributed to every department of the Institute and Botany/ Geology departments of many Indian Universities.

In addition to the staff of the Institute, the Library services were availed by a number of scientists from various organisations/ institutions in India and abroad. Some of the important universities/institutions/organisations are: University of Reading, U. K.; Universitet I Oslo, Norway; Universite Claude Bernard, Lyon, France; R. Ruia College, Bombay; Bangalore University, Bangalore; Indian Agriculture Research Institute, New Delhi; Allahabad University, Allahabad; Punjab University, Chandigarh; University of Roorkee, Roorkee; University of Lucknow, Lucknow; National Botanical Research Institute, Lucknow; Geological Survey of India, Lucknow; and Industrial Toxicological Research Centre, Lucknow.

Museum

Under a special programme "Palaeobotany for Education" fossil specimens/slides were sent to various educational centres. This has been done to popularise the study of fossil plants among botany and geology students.

The cloth lining of nine show cases were changed and the panels depicting palynology, forest history of India, archaeobotany, origin and type of coal and palaeobotany were rearranged.

Fossil Store

The sorting of specimens and putting them in polythene bags were continued.

Type and Figured Specimens/Slides

This year Museum statements of 29 research papers were made. The position of Type and Figured Specimens as on 31st March, 1983 is as under:

Type and Figured Specimens	— 2150
Type and Figured Slides	— 7686
Negatives of the above	— 6625

New Collection from India

This year the scientific staff of the Institute made a collection of samples and megafossils from about 223 localities. The departmentwise details are given below:

	Samples	*Specimens*
Department of Non-Vascular Plants	169	—
Department of Palaeophytic Evolutionary Botany	10	2173
Department of Mesophytic Evolutionary Botany	67	1484

Department of Cenophytic Evolutionary Botany	8	847
Department of Quaternary Biogeography and Archaeobotany	128	—
Department of Pre-Gondwana Palynostratigraphy	575	—
Department of Post-Gondwana Palynostratigraphy of Extra-Peninsular India	459	—
Department of Post-Gondwana Palynostratigraphy of Peninsular India	1960	—
Department of Planktonology	275	—
Department of Biodiageneis	275	—

New Collection from abroad

Fossil specimens were received from the followings:

1. Dr U. Weiss, Bethesda, Maryland, U.S.A.—7 specimens
2. British Museum of Natural History, —93 specimens London, U.K.

Fossil Specimens sent abroad

1. Dr Helmer Achilles, Institut fur Palaeontologie, 53 Bonn, Nussalle-8, West Germany.
2. Professor S. B. Manum, Institut for Geologi, Universitet, i Oslo, Blindern, Norway.
3. Professor Enrico Annoscia, AGIP-CEDI, Centro-Documentazione Informazione, 20097 San Donto Milanese, Italy.

4. Birtish Museum of Natural History, London, U.K.
5. Dr Y. Lemoigne, Universite Claude Bernard, Lyon-1, France.

Specimens/samples received for investigation from the following centres :

1. Geology Department, Gauhati University, Gauhati, Assam.
2. Neyveli Lignite Corporation, South Arcot, Tamil Nadu.
3. Geological Survey of India.
4. Central Coalfields Limited, Ranchi, Bihar.

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

1. Department of Geology, University of Rajasthan, Udaipur.
2. Department of Botany, Agra College, Agra.
3. P. G. Department of Life Science, Sambal University, Sambalpur.
4. Geology Department, Osmania University, Hyderabad.
5. Geology Department, Ranchi University, Ranchi.
6. Botany Department, University of Gorakhpur, Gorakhpur.
7. P. G. Department of Geology, University of Jammu, Jammu.
8. Department of P. G. Studies & Research in Biological Sciences, University of Jabalpur, Jabalpur.
9. Botany Department, University of Saugar, Saugar.

10. Department of Geology, College of Science & Technology, Andhra University, Vishakhapatnam.

11. P. G. Department of Geology, Utkal University, Vani Vihar, Bhubaneshwar.

12. Department of Applied Geology, University of Saugar, Saugar.

13. Department of Botany, University of Nagarjuna, Nagarjunasagar.

14. Botany Department, Kumaon University, Nainital.

15. Department of Botany, University College of Science, Osmania University, Hyderabad.

16. Department of Botany, Punjab University, Chandigarh.

17. Department of Botany, College of Science & Technology, Andhra University, Waltair.

18. Department of Botany, University College, Kakatiya University, Vidyaranyapuri, Warangal.

19. School of Studies in Botany, Vikram University, Ujjain.

20. Department of Geology, Calcutta University, Calcutta.

21. Department of Geology, University College, Tirupati.

22. Department of Pure Geology, Ravishankar University, Raipur.

23. School of Studies, Jiwaji University, Vidya Mandir, Gwalior.

24. Centre of Advance Study in Botany, Banaras Hindu University, Varanasi.

25. P. G. Department of Botany, Bhagalpur University, Bhagalpur.

26. Department of Botany, University, of Rajasthan, Jaipur.

27. Department of Botany, M. B. B. College, Agartala.

28. School of Biological Sciences, Madurai Kamraj University, Madurai.

29. Government Degree College, Jagdalpur, Bastar.

30. Department of Botany, Annamali University Annamalainagar.

31. Department of Geology, University of Mysore, Mysore.

32. Department of Geology, Banaras Hindu University, Varanasi.

33. Department of Geology, Karnatak University, Dharwad.

34. Department of Geology, Bangalore University, Jnana Bharati, Bangalore.

35. Department of Botany, Moti Lal Vigyan Mahavidyalaya, Bhopal.

36. School of Studies in Geology, Vikram University, Ujjain.

37. University of Jodhpur, Jodhpur.

38. Department of Botany, Maharaja College, Chhatarpur.

39. Department of Botany, University of Kashmir, Srinagar.

40. Department of Earth Science, (Civil Engineering Department, I. I. T., Powai, Bombay.

41. Lohia Government College, Churu.

42. V. O. Chidambaram College, Tuticorin.

43. Department of Geology, V. S. R. & V. N. R. College, Tenali.

44. Department of Geology, University of Delhi, Delhi.

45. P. G. Geology Department, Govt. College, Karnal.

46. Botany Department, P. G. College, Guna.

47. Department of Biosciences, University of Jammu, Jammu.

48. Department of Geology, Moti Lal Vigyan Mahavidyalaya, Bhopal

Visitors during the year

In all 425 visitors paid a visit to the Institute's Museum during this year. Nationals of England, Philippines, Bangla Desh, Malayasia, Bhutan, Bulgaria, Sri Lanka, France, U. S. A., USSR, G. D. R. and Norway and the delegates of the I. A. P. Symposium on Cretaceous of India were among the distinguished visitors.

Besides, the students of the following colleges/universities visited the Museum.

1. G. F. College, Shahjahanpur.

2. Students of Botany, Marathwada University, Aurangabad.

3. Rajendra College, Chhapara.

4. Students of Botany, Ranchi University, Ranchi.

5. P. T. Sarvajanik College of Science, Surat.

6. Arya Vidyapeeth College, Gauhati.

7. Serampore College, Serampore.

8. Govt. P. G. College, Guna.

9. P. P. N. College, Kanpur.
10. L.A.D. College, Nagpur.
11. Students of Department of Biosciences, University of Jammu, Jammu.
12. Students of Botany Department, Magadh University, Bodh-Gaya.
13. Students of the Department of Museology, Calcutta University, Calcutta.
14. Department of Botany, Govt. P. G. College, Kotdwar.

Herbarium

Following additions have been made during the period under review.

Specimens	Addition during the year	Total as on 31.3.1983
Herbarium sheets	30	10,611
Fruits and seeds	22	1,857
Wood specimens	114	3,450
Wood slides	264	3,859
Pollen slides	375	10,569
Polliniferous material	23	23
Palm, slides (stem, root, petiole, leaf)	—	3,195

The routine work of label writing, indexing, registration and incorporation, poisoning and restitching of plant specimens, issue and return of the herbarium material to research workers was done.

Sorting and rearranging plant specimens was done from the backlog of the stock. The position was as under :

Identified and mounted specimens	—	309
Identified and unmounted specimens	—	117
Unidentified and mounted specimens	—	1,552
Duplicate specimens for exchange	—	90

Shifting of 56 steep pigeonhole almirahs containing palm material, fruits and seed specimens, polliniferous material, wood specimens and regional collection of pollen slides was done to the second floor.

In order to facilitate the working of the Xylarium wood specimens were systematically rearranged in card board boxes.

Fruits and seeds were rearranged according to Bentham and Hooker's classification. The labels were changed and re-written.

About 375 pollen slides prepared by the scientists of the Institute and 22 fruits and seeds and 264 wood slides were registered.

Facilities of Consultation

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

1. Mr K. M. Prohit,
   Botanical Survey of India,
   Howrah

2. Dr (Mrs) Shukla Sen Gupta,
   Bose Institute,
   Acharya Prafulla Chandra Road,
   Calcutta 700009

Material received from:

1.	Institute for Systematic Botany Transitorium, Heidelberglaan, Utrecht, Netherland	57 wood specimens
2.	Instituto National de Investigacions Forestales, Mexico 21-DF (gifted by Dr K. S. Saraswat)	21 wood specimens
3.	Prof. K. A. Chowdhury, Aligarh Muslim University, Aligarh	4 wood blocks
4.	The Officer-In-Charge, Wood Anatomy Branch, F. R. I., Dehradun	14 wood blocks

Garden

One hundred rose plants of different varieties were purchased. Twelve plants of *Bougainvillea,* 27 plants of *Jatropha* and 60 plants of *Chrysanthemum* were donated to the Institute garden by Dr M. N. Bose. About 40 plants of *Lantana* were transplanted around the Samadhi. The *Cana* beds were made again and choicest varieties were kept. Indoor plants were kept in the corridor of ground floor and they were replaced at regular intervals. Institute lawns were maintained by cutting the grass, cleaning and watering at different time intervals.

Distinguished Visitors

1. Mr J. R. Hiley, Oxford, England.
2. Dr S. Teriokhin Edward, Komarov Botanical Institute of Sciences of USSR, Leningrad, USSR.

3. Mr Ajit Kumar Prasad, Exploration & Excavation Officer, Directorate of Archaeology, Patna, Bihar.

4. Mr Manro T. Alvarez, National Museum of the Philippines, Manila, Philippines.

5. Mr Md. Masud Hussain, Bangla Desh.

6. Mr Mat. Nasur Baba, Kualalampur, Malayasia.

7. Mr Tshewang Gyalpo, Antique Department, Thimpu, Bhutan.

8. Mr Vladimir Kantanav, Third Secretary Bulgarian Embassy, New Delhi.

9. Mme Nalinie Wuualadasa, Sri Lanka.

10. Mr I. Aslam, Department of Earth Sciences, University of Cambridge, England.

11. Dr Monique Fort, Department of Physical Geography, University of Paris, France.

12. Mr Gail Wagner, Department of Anthropology, Washington University, St. Luis, Missouri, U.S.A.

13. Mr F. Descoueyte, Embassy of France, New Delhi.

14. Dr Ditich Wahl, Academy of Sciences of G. D. R.

15. Prof. Y. Lemoigne, Universite Claude Bernard, Lyon-1, France.

Birbal Sahni Professorship

1. Professor T. M. Harris,
Geology Department, University of Reading,
Reading, U. K.

Visiting Scientist

Professor S. B. Manum, Institute of Geology, Universitet i Oslo, Blindern, Oslo, Norway.

Founder's Day Celebrations

On 14th November, 1982 the Birthday of Professor Birbal Sahni, F. R. S. was celebrated. At 9.00 a.m. in the morning wreaths and flowers were placed on the *Samadhi* of Professor Birbal Sahni by Shrimati Savitri Sahni, Staff of the Institute and several other persons.

On 24th November, 1982 at 5.30 p.m., Professor T. M. Harris, University of Reading, U. K. delivered the 12th Birbal Sahni Memorial Lecture entitled "What is palaeobotany for?"

Next day on 25th November, 1982 Professor Svein B. Manum, University of Oslo, Norway delivered the 30th Sir Albert Charles Seward Memorial Lecture entitled "Palynology, organic petrology and petroleum—A palaeobotanist's view" at 5.30 p.m.

The Staff

(as on 1.4.1982)

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. (S.S.O.)
Dr Pramod Kumar, M.Sc., Ph.D. (S.S.O.)
Dr Manoj Shukla, M.Sc., Ph.D. (J.S.O.)
Shri Rupendra Babu, M.Sc. (J.S.A.)
Sri K. L. Meena, M.Sc. (J.S.A.)

Department of Palaeophytic Evolutionary Botany

Dr H. K. Maheshwari, M.Sc., Ph.D., F.P.S. (S.S.O.)
Dr (Mrs) Shaila Chandra, M.Sc., Ph.D., F.L.S. (S.S.O.)
Dr A. K. Srivastava, M.Sc., Ph.D. (J.S.O.)
Dr (Mrs) Usha Bajpai, M.Sc., Ph.D. (S.S.A.)
Shri Bijai Prasad, M.Sc. (J.S.A.)
Shri Kamal Jeet Singh, M.Sc. (J.S.A.)
Mrs Rajni Tiwari, M.Sc. (J.S.A.)

Department of Mesophytic Evolutionary Botany

Dr Sukh Dev, M.Sc. (Hons.), Ph.D (Lucknow), Ph.D. (Reading) (S.S.O.)
Dr Shyam C. Srivastava, M.Sc., Ph.D. (S.S.O.)
Dr (Kumari) Jayasri Banerji, M.Sc., Ph.D. (J.S.O.)
Shri Pankaj Kumar Pal, M.Sc. (S.S.A)
Mrs Rashmi Srivastava, M.Sc. (J.S.A.)
Shri A. Rajnikauth, M.Sc. (J.S.A.)
Kumari Neeru Pandya, M.Sc. (J.S.A.)

Department of Cenophytic Evolutionary Botany

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

Department of Quaternary Biogeography & Archaeobotany

Dr Vishnu-Mittre, M.Sc., Ph.D. (Lucknow), Ph.D. (Cantab), (Assistant Director)
Dr H. P. Gupta, M.Sc., Ph.D. (S.S.O.)
Dr (Mrs) Chhaya Sharma, M.Sc., Ph.D. (J.S.O.)

Shri A. Bhattacharya, M.Sc. (S.S.A.)
Shri R. R. Yadav, M.Sc. (S.S.A)
Dr (Mrs) Asha Khandelwal, M.Sc., Ph.D. (S.S.A.)
Kumari Aruna Sharma, M.Sc. (S.S.A.)
Kumari Chanchala, M.Sc. (S.S.A.)
Shri S. K. Bera, M.Sc. (J.S.A.)
Shri M. S. Chauhan, M.Sc. (J.S.A.)

Department of Pre-Gondwana and Gondwana Palynostratigraphy

Dr R. S. Tiwari, M.Sc., Ph.D. (S.S.O.)
Dr Suresh C. Srivastava, M.Sc., Ph.D. (S.S.O.)
Dr (Mrs) Archana Tripathi, M.Sc., Ph.D. (J.S.O.)
Dr B. N. Jana, M.Sc., Ph.D. (J.S.O.)
Dr (Mrs) Vijaya Singh, M.Sc., Ph.D. (J.S.O.)
Mrs Neerja Jha, M.Sc. (S.S.A.)
Shri Ram Awatar, M.Sc. (J.S.A.)
Shri K. L. Meena, M.Sc. (J.S.A.)

Department of Post-Gondwana Palynostratigraphy of Peninsular India

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

Department of Post-Gondwana Palynostratigraphy of Extra-Peninsular India

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

Department of Planktonology

Dr K. P. Jain, M.Sc., Ph.D. (S.S.O.)
Dr S. A. Jafar, M.Sc., Ph.D. (S.S.O.)
Shri Rahul Garg, M.Sc. (S.S.A.)
Shri Khowaja Ateequazzaman, M.Sc. (J.S.A.)
Shri Rajesh Kumar Saxena, M.Sc. (J.S.A)
Mrs 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. (S.S.O.)
Dr Anand Prakash, M.Sc., Ph.D. (S.S.O.)
Shri B. K. Misra, M.Sc. (S.S.A.)
Shri Rakesh Saxena, M.Sc. (S.S.A.)
Kumari Alpana Agarwal, M.Sc. (J.S.A.)
Shri O. S. Sarate, M.Sc. (J.S.A.)
Shri Bhagwan Das Singh, M.Sc. (J.S.A.)

Department of Radiometric Dating

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

Publication & Information Section
Publication

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

Library

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

Museum

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

Herbarium

Dr H. A. Khan, M.Sc., Ph.D. (Curator)
Shri J. C. Srivastava, M.Sc. (Herbarium Incharge)
Shri Diwakar Pradhan, B.Sc. (Herbarium Assistant)
Shri A. K. Singh Rathore, B.Sc. (Herbarium Assistant)

Laboratory Services

Shri H. N. Boral, B.Sc. (S.T.A)
Shri 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.)
Shri D. C. Joshi, B.Sc. (J.T.A.)
Kumari Kamla Amarlal, B.Sc. (J.T.A.)
Shri N. K. Khasnavis B.Sc., LL.B. (J.T.A.)
Shri I. J. Mehra, B.A. (Lab. Assistant)
Shri A. K. Ghosh (Electrician)
Shri T. K. Mandal B.Sc. (J.T.A.)
Shri Vijay Singh Panwar (Glass Blower)
Shri P. S. Salujha (Mechanic)
Shri E. G. Khare, B.Sc. (J.T.A.)
Shri K. B. Gupta, B.Sc. (J.L.A.)
Smt. Sangita Gupta, B.Sc. (J.L.A.)
Shri A. K. Srivastava, B.Sc. (J.L.A.)
Kumari Reeta Chatterji, B.Sc. (J.L.A.)
Shri Keshav Ram (J.L.A.)
Shri Chandra Pal, B Sc. (J.L.A.)
Shri Prem Prakash, B.Sc. (J.L.A.)

Photography & Drawing

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

Stores

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

Accounts Section

Shri Ghanshyam Singh, B.Com. (Accounts Officer)
Shri T. N. Shukla, B.A. (Accountant)
Shri B. K. Jain, B.A. (Junior Accountant)
Shri N. N. Joshi (U.D.C.)
Shri R. K. Takru, B.A. (U.D.C.)
Shri Dhoom Singh, B.A. (L.D.C.)
Shri A. K. Agarwal, B.Com. (L.D.C.)

Administration

Shri Gurcharan Singh, M.A., LL.B. (Registrar)
Shri S. D. Mehtani (Deputy Registrar)
Shri S. K. Suri (Stenographer)
Shri S. P. Chadha, B.A. (P.A. to Director)
Shri H. S. Srivastava, B.Com. (Office Assistant)
Shri Bhagwan Singh (Assistant)
Shri R. B. Kukreti (Caretaker)
Smt. P. K. Srivastava (Receptionist)
Shri I. J. S. Bedi (U.D.C.)
Shri Ramesh Chandra (L.D.C.)
Shri 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.)
Smt. Lalitha Nair (L.D.C.)
Shri Hari Lal (L.D.C.)

Drivers

Shri Hanuman Prasad
Shri Lallan
Shri Balbir Singh

General Help

Shri Bhim Singh (Mechanic-cum-Section Cutter)
Shri Mahipal Singh (Mechanic)
Shri Chandra Bali (Section Cutter)
Shri Sarju Prasad (Daftri)
Shri Sia Ram (Duplicating Machine Operator)
Shri Roop Chand (Lab. Attendant)
Shri Satruhan (Lab. Attendant)
Shri Sunder Lal (Lab. Attendant)
Shri Bashir (Lab. Attendant)
Shri Prem Chandra (Peon)
Shri Ram Singh (Peon)
Shri Rajendra Kumar (Peon)
Shri K. C. Chandola (Peon)
Shri Sri Ram (Peon)
Shri Haradhan Mahanti (Peon)
Shri Bam Singh (Peon)
Shri Kedar Nath (Peon)
Shri Lalta Prasad (Peon)
Shri Prem Shanker (Chowkidar)
Shri Ram Dhari (Chowkidar)
Shri Vishnu-Kumar (Chowkidar)
Shri Ram Deen (Chowkidar)
Shri Kesho Ram (Chowkidar)
Shri Bishnu Dutt (Chowkidar)
Shri Ram Sahai (Mali-skilled)
Shri Bipat (Mali-skilled)
Shri Chaitu (Mali-skilled)
Shri Rameshwar Prasad Pal (Mali-unskilled)
Shri Chhanga Lal (Safaiwala)
Shri Nanhoo (Safaiwala)
Shri Mewa Lal (Safaiwala)
Shri Ram Kishan (Safaiwala)
Smt. Munni (Safaiwali)

Appointments & Promotions

Department of Non-Vascular Plants

1. Dr P. K. Maithy, Senior Scientific Officer, appointed as Assistant Director w.e.f. 18th November, 1982 (AN).

2. Shri K. L. Meena, M.Sc., appointed as Junior Scientific Assistant w.e.f. 7th April, 1982.

3. Shri P. K. Misra, M.Sc., appointed as Junior Scientific Assisttant w.e.f. 26th June, 1982.

Department of Palaeophytic Evolutionary Botany

1. Dr H. K. Maheshwari, Senior Scientific Officer, appointed as Assistant Director w.e.f. 18th November, 1982(AN).

2. Shri V. K. Singh, M.Sc., appointed as Junior Scientific Assistant w.e.f. 2nd February, 1983.

Department of Mesophytic Evolutionary Botany

1. Dr Sukh Dev, Senior Scientific Officer, appointed as Assistant Director w.e.f. 18th November, 1982 (AN).

2. Dr (Kumari) Jayasri Banerjee, Junior Scientific Officer, appointed as Senior Scientific Officer w.e.f. 18th November, 1982 (AN).

3. Shri S. R. Manik, M.Sc., appointed as Junior Scientific Assistant w.e.f. 22nd April, 1982.

Department of Cenophytic Evolutionary Botany

1. Dr M. B. Bande, Junior Scientific Officer, appointed as Senior Scientific Officer w.e.f. 22nd November, 1982.

Department of Quaternary Biogeography & Archaeobotany

1. Dr (Smt.) Chhaya Sharma, Junior Scientific Officer, appointed as Senior Scientific Officer w.e.f. 18th November, 1982 (AN).

2. Dr K. S. Saraswat, M.Sc., Ph.D., appointed as Senior Scientific Officer w.e.f. 31st December, 1982.

Department of Pre-Gondwana and Gondwana Palynostratigraphy

Dr R. S. Tiwari, Senior Scientific Officer, appointed as Assistant Director w.e.f. 18th November, 1982 (AN).

Department of Post-Gondwana Palynostratigraphy of Peninsular India

1. Dr R. K. Kar, Senior Scientific Officer, appointed as Assistant Director w.e.f. 19th November, 1982.

2. Shri A. P. Bhattacharya, M.Sc., appointed as Junior Scientific Assistant w.e.f. 12th July, 1982.

3. Shri G. K. Trivedi, M.Sc., appointed as Junior Scientific Assistant w.e.f. 5th November, 1982.

Department of Planktonology

Dr K. P. Jain, Senior Scientific Officer, appointed as Assistant Director w.e.f 18th November, 1982 (AN).

Department of Biodiagenesis

Dr G. K. B. Navale, Senior Scientific Officer appointed as Assistant Director w.e.f. 18th November, 1982 (AN).

Museum

Shri Prem Prakash, B.Sc., appointed as Junior Museum Assistant w.e.f. 4th October, 1982.

General Help

1. Shri Prem Chandra, Peon, appointed as Lab. Attendant w.e.f. 29th July, 1982.

2. Shri Kailash Nath, was appointed as Peon w.e.f. 2nd November, 1982.

3. Smt. Maya Devi was appointed as Safaiwali w.e.f. 23rd September, 1982.

Committees

Finance and Building Committee
Chairman

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

Members

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

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

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

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

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

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

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. Gandhinagar,
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,
Pondicherry

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

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

Dark Room Committee

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

Herbarium Committee

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

Incharge Vehicles and Guest House Maintenance

Dr Anand Prakash

Maintenance Committee

Dr K. P. Jain, Convener
Dr Shyam C. Srivastava
Dr K. Ambwani
Dr R. K. Saxena
Shri S. B. Verma

Museum Committee

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

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

Publication & Information Committee

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

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

AUDITOR'S 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, 1983 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, 1983 and the Income & Expenditure Account gives a true and fair view of income over expenditure.

For R. N. KHANNA & COMPANY
Chartered Accountants

(Sd. R. N. KHANNA)
Partner

NOTES ON BALANCE SHEET OF BIRBAL SAHNI INSTITUTE OF PALAEOBOTANY, LUCKNOW AS AT 31ST MARCH, 1983

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 in the Balance Sheet.

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

Apparatus & equipments	1,000.00	
Books & Journals	12,956.75	
Maps & Toposheets	91.96	14,048.71
TOTAL		14,048.71

For R. N. KHANNA & COMPANY
Chartered Accountants

(Sd. R. N. KHANNA)
Partner

Place: Lucknow
Date : 3.8.1983

Statement of Accounts for the year 1982-83

Birbal Sahni Institute

Balance Sheet as on

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.	AMOUNT Rs.
Capital Fund:			
Balance as per Last Year's Balance Sheet		86,17,826.24	
Add: Govt. of India Grants on Capital Account ..		22,75,000.00	
Recurring Expenditure used for creating Fixed Assets:			
Chemical Glassware	1,000.00		
Books & Journals	12,956.75		
Maps & Toposheets	91.96	14,048.71	1,09,06,874.95
Less: Amount transferred to Recurring Account ..			6,666.67
			1,09,00,208.28
Advance Fund for Employees:			
As per Last Year's Balance Sheet ..	4,10,914.00		
Advances during the year ..	1,14,942.00	5,25,856.00	
Less: Refunds during the year ..		64,679.00	4,61,177.00

of Palaeobotany, Lucknow

31st March, 1983

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 .. 4,78,530.78		
Additions during the year 4,47,305.40	9,25,836.18	26,52,488.22
Research Apparatus & Equipments:		
As per last year's Balance Sheet	18,81,846.82	
Additions during the year ..	2,44,155.72	21,26,002.54
Workshop Equipment:		
As per last year's Balance Sheet		67,374.85
Office and Miscellaneous Equipments:		
As per last year's Balance Sheet	1,32,452.06	

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.	AMOUNT Rs.
Excess of Income over Expenditure ..		3,78,294.95	
Less: Transfer to Advance Fund ...		50,263.00	3,28,031.95
Donated Fund/Grants			
Cost of Land donated by U.P. Govt.		32,292.00	
Founders' donation		1,52,500.00	
C.D. Pant Memorial Fund ..		2,076.88	
C.L. Katiyal Memorial Fund ..		4,261.08	
P.C. Bhandari Memorial Fund ..		3,198.05	
A.C. Seward Memorial Fund ..		11,183.58	
Other Misc. Donations ..		11,721.29	
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	

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Additions during the year (Photography) ..	2,346.00	1,34,798.06
Establishment of C-14 Radiometric Lab:		
As per last year's Balance Sheet	12,83,165.56	
Additions during the year ..	10,25,625.63	23,08,791.19
Plant and Machinery:		
As per last year's Balance Sheet	3,94,316.48	
Additions during the year ..	2,03,377.95	5,97,694.43
Apparatus & Equipment (Donated):		
M.G.T. Scheme (C.S.I.R.) ..	7,155.79	
Burmah Oil Co.	700.00	
Founder's Donation ..	2,500.00	
Coal Scheme (C.S.I.R.) ..	6,645.29	
Palynological Scheme (C.S.I.R.)	5,207.87	
Rajasthan Scheme (Sponsored by 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.
UNESCO Funds aid		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 Memorial Fund ..		2,880.00	
Birbal Sahni Research Award Endowment		19,500.00	3,80,245.10
General Provident Fund/Contributory Provident Fund:			16,09,686.46
Current Liabilities and Provisions:			
Security & Earnest Money deposits ..			47, 512.00
Total C/o ..			1,37,26,860.79

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Vehicles:		
As per last year's Balance Sheet	2,76,049.07	
Additions during the year ..	12,636.00	2,88,685.07
Furniture and Fixtures:		
As per last year's Balance Sheet	6,75,426.90	
Additions during the year ..	1,55,550.32	8,30,977.22
Furniture and Fixtures (Donated):		
Burmah Oil Company ..	1,200.00	
M.G.T. Scheme (C.S.I.R.) ..	945.00	
Coal Scheme (C.S.I.R.) ..	1,139.37	
Rajasthan Scheme (Sponsored by University of Wisconsin) ..	979.70	4,264.07
Books and Journals:		
As per last year's Balance Sheet	3,98,090.31	
Additions during the year:		
Out of Revenue Account ..	12,956.75	4,11,047.06

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.	AMOUNT Rs.
Total B/F ..			1,37,26,860.79
Total ..			1,37,26,860.79

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Founder's Library (Donated):		50,000.00
Founder's Fossil Collection (Donated):		50,000.00
Maps & Toposheets:		
As per last year's Balance Sheet	12,970.09	
Additions during the year ..	91.96	13,062.05
Investments (Donation Account):		52,000.00
UNESCO Book Coupons:		793.02
Cash and Bank Balances:		
Cash in hand (Imprest Account)	360.53	
Current Account with State Bank of India	14,58,391.71	14,58,752.26
Loans and Advances:		
Unsettled advances Plan Revenue Account ..	1,07,671.59	
Unsettled advances Plan Capital Account ..	3,16,136.50	
Unsettled advance Non-Plan Revenue Account ..	15,098.10	4,38,906.19

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.	AMOUNT Rs.
Total B/F ..			1,37,26,860.79
Total ..			1,37,26,860.79

(Sd.)
Ghanshyam Singh
Accounts Officer

(Sd.)
Gurcharan Singh
Registrar

(Sd.)
M. N. Bose
Director

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Advances to Employees:		
House Building Advance ..	3,70,765.00	
Festival Advance ..	12,360.00	
Conveyance Advance ..	78,052.00	4,61.177.00
General Provident Fund/ Contributory Provident Fund:		
Investments	11,50,000.00	
Advance out of G.P.F. ..	1,39,445.00	
Insurance out of G.P.F. ..	15,956.79	
With State Bank of India ..	3,04,284.67	16,09,686.46
Total ..		1,37,26,860.79

Auditor's Report

As per our attached report of even date.

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

(Sd.) R. N. KHANNA
Partner

Place: Lucknow
Dated: 3rd August, 1983

Birbal Sahni Institute

Income and Expenditure Account for the

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Academic Expenses:			
To pay & Allowance of Academic staff ..	4,15,490.34	12,52,298.85	16,67,789.19
To Field Excursion	26,089.85	18,512.53	44,602.38
To Remuneration of Birbal Sahni Professor	26,697.55	—	26,697.55
To Sponsoring & Participation in Conference & Symposia, etc. ..	10,000.00	—	10,000.00
To Honorarium to Lecturers :			
For Birbal Sahni Mem. Lecture ..	—	500.00	500.00
For Silver Jubilee Mem. Lecture ..	—	—	—
To International Programmes:			
Deputation Abroad	—	16,652.75	16,652.75
Honorarium for Visiting Scientist ..	24,662.58	—	24,662.58

of Palaeobotany, Lucknow

Year ending 31st March, 1983

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Balance of last year's grant of Revenue Account allowed for expenditure during Current Year ..	39,242.11	1,01,166.81	1,40,408.92
By Grants from Govt. of India on Revenue Account ..	10,00,000.00	30,79,000.00	40,79,000.00
By Grants from U. P. Govt. on Revenue Account ..	—	—	—
By Sale Proceeds of priced publications:			
"The Palaeobotanist"	—	68,267.22	68,267.22
The Monograph ..	—	2,496.15	2,496.15
Symposium & Spl. Publication ..	—	1,464.60	1,464.60
Seward Memorial Lecture ..	—	466.60	466.60
Birbal Sahni Mem. Lecture ..	—	192.00	192.00
Silver Jubilee Mem. Lecture ..	—	102.00	102.00

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To expenses of services ancillary to research:			
To Pay & Allowance of Auxi. Technical Staff ..	1,04,555.44	4,18,988.93	5,23,544.37
To Chemicals & Glasswares, Photo-goods & Small App. etc. ..	54,977.20	1,73,830.62	2,28,807.82
To Library Requirements ..	—	19,828.75	19,828.75
To Museum Requirements ..	972.40	3,835.79	4,808.19
To Maintenance of Apparatus & Equipments and Workshop Machinery ..	—	—	—
To Publication Expenses :			
"The Palaeobotanist"	—	78,560.35	78,560.35
Birbal Sahni Mem. Lecture ..	—	—	—
Annual Report ..	—	9,917.00	9,917.00
Seward Mem. Lecture ..	—	—	—
Silver Jubilee Lecture ..	—	—	—

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Picture Post Cards	—	226.50	226.50
Catalogue of Indian Fossil Plants ..	—	970.55	970.55
Aspects & Appraisal of Indian Palaeobotany ..	—	955.00	955.00
IV I. P. C. Proceedings ..	—	1,522.75	1,522.75
By Miscellaneous Receipts and Recoveries:			
Vehicle Charges ..	—	78.25	78.25
By Telephone Charges ..	—	999.45	999.45
By V. S. Room Charges ..	—	310.00	310.00
By Application Fees	—	616.00	616.00
Miscellaneous Receipts and Recoveries	1,725.46	14,230.10	15,955.56
Recovery of Conveyance Advance ..	—	—	—
Int. on Conveyance Advance ..	—	436.30	436.30
Recovery of Festival Advance ..	—	—	—

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Publication of IV I.P.C. Proceedings	—	2,716.96	2,716.96
Travelling & other Allowances :			
For Governing Body, Scientific Programme & Evaluation Committee and Selection Committee Meetings	—	16,108.74	16,108.74
For attending Scientific meetings & Conferences in India and for other purposes	1,728.10	29,198.04	30,926.14
For Reimbursement of Medical Expenses	5,748.64	16,456.05	22.204.69
For Over Time Allowance ..	270.36	2,160.45	2,430.81
For Leave Travel Concession ..	6,358.20	35,617.09	41,975.29
For Reimbursement of Tuition Fees ..	129.00	402.25	531.25
For Children Educ. Allowance ..	—	—	—
Funds for Training of Staff in India	—	—	—
Efficiency Bonus ..	268.34	805.01	1,073.35

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Recovery of House Building Advance ..	—	—	—
Pension Contribution ..	—	609.19	609.19
Interest on House Building Advance ..	—	—	—
Employees Insurance Scheme ..	1,347.50	5,538.00	6,885.50
Deposit Account ..	—	—	—
Interest earned on Savings Bank Account ..	—	30,846.94	30,846.94
Total	10,42,315.07	33,10,494.41	43,52,809.48

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Pensionary Expenses :			
To Superannuation Allowance & Pension ..	—	1,07,469.20	1,07,469.20
Payment under Insurance Scheme ..	—	473.00	473.00
G. P. F. Interest ..	—	84,787.48	84,787.48
C. P. F. Contribution	—	1,860.00	1,860.00
To General Expenses :			
To Pay & Allowance of Administrative Staff	1,05,611.29	4,89,598.66	5,95,209.95
To Telephone & Trunk Call Charges	—	27,177.05	27,177.05
To Postage ..	—	36,452.00	36,452.00
To Advertisement Charges ..	4,000.25	27,889.40	31,889.65
To Hot & Cold Weather Charges ..	1,000.00	5,000.00	6,000.00
To Petrol & Mobil Oil	2,446.96	8,376.74	10,823.70
To Electricity Charges ..	19,922.98	40,327.49	60,250.47
To Municipal Taxes	—	5,326.83	5,326.83

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F ..	10,42,315.07	33,10,494.41	43,52,809.48
Total ..	10,42,315.07	33,10,494.41	43,52,809.48

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Insurance of Vehicle & Library	—	4,222.00	4,222.00
To Uniform to Class IV Staff ..	1,236.71	7,357.62	8,594.33
To Printing & Stationary ..	12,416.30	29,129.69	41,545.99
To Custom Duty & Port Trust Ch. ..	—	—	—
To Railway Ft. & Carriage ..	—	2,877.96	2,877.96
To Entertainment Allowance to Director ..	—	2,258.78	2,258.78
To Miscellaneous & Unforeseen ..	15,000.00	44,457.41	59,457.41
To Maintenance Expenses:			
To Building ..	—	7,622.45	7,622.45
To Garden ..	—	5,225.83	5,225.83
To Vehicle ..	9,915.75	7,756.74	17,672.49
To Repairs & Renewals ..	11,188.98	11,037.64	22,226.62
To Equipment ..	22,966.22	—	22,966.22
To other Expenses :			
To Deposits Refunded ..	—	—	—

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F ..	10,42,315.07	33,10,494.41	43,52,809.48
Total ..	10,42,315.07	33,10,494.41	43,52,809.48

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Medical Advice	—	112.00	112.00
To Audit Fees ..	—	2,000.00	2,000.00
To Legal Advice ..	—	—	—
To Welfare Expenses :			
To Financial Assistance to Departmental Canteen ..	—	5,668.50	5,668.50
To Govt. of India Scholarship Expenses :			
B. S. Research Scholarship ..	—	20,600.00	20,600.00
B. S. Research Contingency ..	—	8,400.00	8,400.00
To Amount transferred to C.N.R. Account :			
Excess of Income over Expenditure ..	1,58,661.63	2,19,633.32	3,78,294.95
Total ..	10,42,315.07	33,10,494.41	43,52,809.48

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.
Total B/F ..	10,42,315.07	33,10,494.41	43,52,809.48
Total ..	10,42,315.07	33,10,494.41	43,52,809.48

(Sd. Ghanshyam Singh)
Accounts Officer

(Sd. Gurcharan Singh)
Registrar

(Sd. M. N. Bose)
Director

Birbal Sahni Institute of

Receipts and Payment for the

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Opening Balance:			
Bank Account:			
Non-Plan Revenue Account ..	—	99,625.50	99,625.50
Plan Revenue Account ..	39,242.11	—	39,242.11
Plan Capital Account ..	9,24,987.71	—	9,24,987.71
Donation Account	—	5,820.88	5,820.88
IV I.P.C. Account	—	1,194.21	1,194.21
Cash Account:			
Non-Plan Revenue Account ..	—	347.10	347.10
To Govt. of India Grants on Capital Account: ..	22,75,000.00	—	22,75,000.00
To Govt. of India Grants on Revenue Account: ..	10,00,000.00	30,79,000.00	40,79,000.00
To Govt. of U. P. Grant of Recurring Account: ..	—	—	—

Palaeobotany, Lucknow

period from 1.4.1982 to 31.3.1983

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Capital Account:			
By Works and Building ..	4,47,305.40	—	4,47,305.40
By Research Apparatus and Equipments ..	2,15,695.11	—	2,15,695.11
By Equip. for Services Ancillary to Research:			
Library	60,010.75	—	60,010.75
Photography	2,346.00	—	2,346.00
C-14 Laboratory ..	8,49,755.83	—	8,49,755.83
Plant & Machinery	2,30,244.51	—	2,30,244.51
By Furniture & Fixture: ..	1,43.850.32	—	1,43,850.32
By Vehicles: ..	12,636.00	—	12,636.00
By transfer to Last year's interest on S. B. to Current Account ..	6,666.67	—	6,666.67
By Refunds of Grant to Govt.			
Out of Capital Grants ..	—	—	—

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Sale Proceeds of Publications:			
The Palaeobotanist	—	68,267.22	68,267.22
Monograph	—	2,496.15	2,496.15
Symposium	—	1,464.60	1,464.60
Catalogue	—	970.55	970.55
Aspects & Appraisal of Indian Palaeobotany ..	—	955.00	955.00
Seward Memorial Lecture ..	—	466.60	466.60
Birbal Sahni Mem. Lecture ..	—	192.00	192.00
Silver Jubilee Mem. Lecture ..	—	102.00	102.00
Picture Post Cards	—	226.50	226.50
IV I.P.C. Proceedings ..	—	1,522.75	1,522.75
To Administrative Receipts:			
Income Tax	2,865.00	47,147.00	50,012.00
Insurance Premium (S. S. Scheme) ..	3,187.83	43,724.22	46,912.05
C.T.D. Post Office	1,320.00	5,780.00	7,100.00
G.P.F. Subscription	52,713.86	2,80,018.91	3,32,732.77

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Revenue Account:			
By Pay and Allowances:			
Pay (Academic) ..	1,89,637.02	6,43,874.66	8,33,511.68
Pay (Aux. Technical) ..	40,810.19	1,81,522.54	2,22,332.73
Pay (Administrative)	44.015.17	2,13,382.88	2,57,398.05
D.A. & Addl. D.A.	2,79,487.39	8,97,707.55	11,77,194.94
House Rent Allowance ..	55,598.85	1,71,643.65	2,27,242.50
City Comp. Allowance ..	16,108.45	52,755.16	68,863.61
Children Education Allowance ..	—	—	—
Over Time Allowance ..	270.36	2,160.45	2,430.81
Medical Reimbursement ..	6,248.64	16,756.05	23,004.69
Reim. of Tuition Fees ..	129.00	402.25	531.25
Leave Travel Concession ..	6,547.20	36,685.09	43,232.29
Efficiency Bonus ..	268.34	805.01	1,073.35

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Recovery of G.P.F. Advance ..	15,225.00	95,335.00	1,10,560.00
Recovery of B.S.I.P. Credit ..	7,660.55	37,914.47	45,575.02
Co-operative Society			
To Misc. Receipts & Recoveries:			
Application fees	—	616.00	616.00
V. S. Room Rent	—	310.00	310.00
Telephone Charges	—	999.45	999.45
Vehicle Charges	—	78.25	78.25
Pension Contribution	—	609.19	609.19
Other Misc. Receipts	1,725.46	14,230.10	15,955.56
C.D.S. from R.P.F. Commiss. Kanpur..	—	32,509.73	32,509,73
To Recoveries of Loans and Advances:			
Recovery of Festival Advance ..	—	21,180.00	21,180.00
Recovery of Conveyance Advance ..	—	21,206.00	21,206.00
Interest on Conv. Advance ..	—	436.30	436.30
Recovery of Flood Advance ..	—	—	—

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
By Travelling Allowance:			
Governing Body & Selection Committee Meetings ..	—	16,108.74	16,108.74
For Attending Meetings & Conferences in India ..	—	4,802.15	4,802.15
Funds for training of Staff in India ..	—	—	—
For other Purposes	1,728.10	29,145.89	30,873.99
By Maintenance of Property:			
For Building ..	—	8,242.45	8,242.45
For Garden ..	—	5,225.83	5,225.83
For Equipment & Apparatus ..	22,966.22	—	22,966.22
For Vehicles ..	9,915.75	7,756.74	17,672.49
For Repairs & Renewals and for Petty Construction	11,188.98	11,037.64	22,226.62
By Contingencies:			
By Telephone & Trunk Call Charges	—	27,177.05	27,177.05
For Postage ..	—	36,452.00	36,452.00

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Recovery of House Building Advance	—	22,293.00	22,293.00
Interest on House Building Advance	—	—	—
To Deposits:			
Employees Insurance Scheme ..	1,347.50	5,538.00	6,885.50
Security Deposits ..	19,192.00	—	19,192.00
To Donation and Endowments:			
Proceeds of Interest	—	4,500.00	4,500.00
To Misc. Receipts on Capital Account:			
Interest earned in Savings Bank Account ..	—	30,846.94	30.846.94
Misc. Receipts on Capital Account	—	—	—
Total C/o	43,44,467.02	39,27,923.62	82,72,390.64

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
For Advertisement	4,000.25	27,889.40	31,889.65
For Hot & Cold Weather Charges ..	1,000.00	5,000.00	6,000.00
For Petrol & Mobil Oil ..	2,446.96	8,376.74	10,823.70
For Electricity Charges ..	19,922.98	40,327.49	60,250.47
For Municipal Taxes ..	—	5,326.83	5,326.83
For Insurance of Vehicle & Library	—	4,222.00	4,222.00
For Liveries to Sub. Staff ..	1,236.71	9,549.05	10,785.76
For Printing & Stationery ..	12,416.30	29,129.69	41,545.99
For Railway Ft. & Carriage ..	—	2,877.96	2,877.96
For Entertainment Allowance to Director ..	—	2,258.78	2,258.78
For Misc. & Unforeseen ..	15,000.00	44,788.41	59,788.41
For Chemicals & Glasswares ..	54,977.20	1,73,830.62	2,28,807.82
For Library Requirement ..	—	19,828.75	19,828.75

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	43,44,467.02	39,27,923.62	82,72,390.64
Total	43,44,467.02	39,27,923.62	82,72,390.64

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
For Herbarium Requirement ..	—	—	—
For Museum Requirement ..	972.40	3,835.79	4,808.19
For Legal Advice	—	—	—
For Medical Advice	—	112.00	112.00
For Audit Fees ..	—	2,000.00	2,000.00
For Publications:			
The Palaeobotanist	—	78,560.35	78,560.35
For Seward Memorial Lecture ..	—	—	—
For Annual Report	—	9,917.00	9,917.00
For Birbal Sahni Mem. Lecture ..	—	500.00	500.00
For Silver Jubilee Memorial Lecture	—	—	—
For IV I.P.C. Proceedings ..	—	2,716.96	2,716.96
For Spl. Publication by B.S. Professor ..	—	—	—

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	43,44,467.02	39,27,923.62	82,72,390.64
Total	43,44,467.02	39,27,923.62	82,72,390.64

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
For Academic Expenses:			
For Field Excursion	1,33,072.44	24,350.20	1,57,422.64
Birbal Sahni Mem. Lecture ..	—	—	—
For Sir A. C. Seward Mem. Lecture out of Donation A/c. ..	—	500.00	500.00
For Silver Jubilee Lecture for Remuneration of B.S. ..	—	—	—
Professorship to Prof. T.M. Harris..	26,697.55	—	26,697.55
Symposium & Seminar Cosponsored & Participated ..	10,000.00	—	10,000.00
For International Programmes:			
Air Passage for member of Staff Proceeding on foreign fellowship for inviting to attend Scientific Meetings & Conferences abroad (Deputation Abroad)	—	16,652.75	16,652.75
Honorarium for Visiting Scientist ..	24,662.58	—	24,662.58

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	43,44,467.02	39,27,923.62	82,72,390.64
Total	43,44,467.02	39,27,923.62	82,72,390.64

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
By Welfare Expenses:			
Financial Assistance to Departmental Canteen ..	—	5,668.50	5,668.50
By G.P.F. Account:			
G.P.F. Subscription transferred to G.P.F. Account ..	52,713.86	2,80,018.91	3,32,732.77
Recovery of Advance transferred to G.P.F. A/c. ..	15,225.00	95,335.00	1,10,560.00
G.P.F. Interest ..	—	84,787.48	84,787.48
Institute Contribution G.P.F. ..	—	1,860.00	1,860.00
By Miscellaneous:			
Income Tax Remitted ...	2,865.00	47,147.00	50,012.00
Insurance Premium Remitted (S. S. Scheme) ..	3,187.83	43,724.22	46,912.05
C.T.D. Amount Remitted (Post Office)	1,320.00	5,780.00	7,100.00
B.S.I.P. Co-operative Credit Society	7,660.55	37,914.47	45,575.02
C.D.S. from R.P.F. Commissioner, Kanpur ..	—	32,509.73	32,509.73

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	43,44,467.02	39,27,923.62	82,72,390.64
Total	43,44,467.02	39,27,923.62	82,72,390.64

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
By Govt. of India Senior Research Scholarship: ..	—	1,006.46	1,006.46
B. S. Research Scholarship ..	—	20,600.00	20,600.00
B. S. Research Contingency ..	—	8,400.00	8,400.00
By Loans and Advances:			
Festival Advance ..	—	18,800.00	18,000.00
Conveyance Advance ..	—	25,342.00	25,342.00
House Building Advance ..	—	70,800.00	70,800.00
Security Money refunded to Contractor ..	—	—	—
By Investments:			
Funds under Donation & Endowment Invested ..	—	7,000.00	7,000.00
By Pension & Superannuation:			
Pension, Family Pension & Gratuity, etc. ..	—	1,07,469.20	1,07,469.20

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total	43,44,467.02	39,27,923.62	82,72,390.64
Total	43,44,467.02	39,27,923.62	82,72,390.64

BALANCES

	Bank	Cash	Total
Plan:			
Central Recurring	50,990.04	—	50,990.04
Central Non-Recurring			
In Cash Book	50,669.12	—	—
In Savings Bank A/c	12,00,000.00	—	12,50,669.12
Non-Plan:			
Central Recurring	1,53,911.67	360.55	1,54,272.22
Donation & Endowment	2,820.88	—	2,820.88
To tal	14,58,391.71	360.55	14,58,752.26

PAYMENT	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Payment under Insurance Scheme ..	—	473.00	473.00
Total	30,42,807.86	37,70,830.52	68,13,638.38
Closing Balance	13,01,659.16	1,56,093.10	14,58,752.26
Total	43,44,467.02	39,27,923.62	82,72,390.64

(Sd.)	(Sd.)	(Sd.)
Ghanshyam Singh	Gurcharan Singh	M. N. Bose
Accounts Officer	*Registrar*	*Director*

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
Dated: 3rd August, 1983

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