annual report

1977-78

BIRBAL SAHNI INSTITUTE OF PALAEOBOTANY LUCKNOW

ANNUAL REPORT
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I. INTRODUCTION

The Institute conducts research in varied aspects of palaeobotany and plays an important role in disseminating the palaeobotanical knowledge all over the world. The research activities at the Institute are organized under six scientific departments, a geology section and a C–14 Laboratory. To carry out active and systematic research the Institute has taken up a number of projects which mainly fall under the following areas of research during the 5th Five Year Plan period :

1. Search for early plant life in Indian rocks older than 300 million years.

2. To build up a composite picture of plant life as existed during the coal-forming period in India.

3. The evolution of plant life through the geological ages in India.

4. History of plant life during the last glacial epoch in India.

5. History of cultivated plants in India.

6. Study of pollen and spores recovered from sediments of various ages to ascertain the location and distribution of coal seams.

7. Study of pollen and spores from various sediments to indicate favourable areas for oil prospecting.

8. Intensive field mapping of prospective coal and oil containing areas for correlation.

9. Dating of sediments with radioactive isotopes.

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

Two types of biota have been identified from the microbiota of the stromatolites recovered from the 2 billion years old rock phosphate deposits of Jhamarkotra, Matoon Formation.

The remains of colonial and filamentous algae have been recorded for the first time from the Ganga Valley samples.

From the detailed study of the Indian species of *Glossopteris* it appears that distinct taxa of *Glossopteris* could be precisely identified from the venation pattern and shapes of leaves. Furthermore, it appears likely that Barakar, Karharbari and Raniganj stages have distinct species of *Glossopteris* and some of these may serve as index fossils for the Lower Gondwana horizons.

From the Kamthi beds of Wardha-Godavari Valley (Lower Gondwana), the woods of *Taxopitys* and *Australoxylon* have been reported for the first time from India. From the new collections made from South Karanpura Coalfield the occurrence of certain interesting Arthrophyte remains has been reported.

The analysis of samples from East Raniganj Coalfield has suggested a Triassic age for this horizon and confirmed the subsurface existence in the region and consequently enhanced the possibility of the extension of coal bearing strata in the eastern most region of the coalfield, which was not yet certain.

A significant fact emerging from the analytical data of vitrinitic and fusinitic constituents in the Permian coals of India has not only indicated certain coal properties but also helped in dating and correlating the coal seams.

The detailed study of leaf-impressions and fossil woods from Kutch has depicted a picture of the vegetation during the Tertiary times which is entirely different from the present one.

The presence of Dipterocarps and other associated plant remains from the Lower Siwalik beds has revealed the existence of evergreen forests all along the foot hills of North India during the late Tertiary period.

On the basis of the detailed studies, the so-called unfossiliferous sequence of Girujan clays in Upper Assam Valley has been differentiated into three biozones, viz., *Cyathidites minor*, *Striatriletes girujanensis* and *Lobiplanktonia lobata* biozones. The palynological assemblages characterizing these zones have proved of quite reliable in distinguishing the top, middle and bottom parts of the sequence.

The pollen analysis of a clay sample from near Kalidhan, district Sirmur has revealed open subtropical pine woods.

The upper limit of zone HS-II in the Mendhata pollen profile has been radiocarbon dated to 4,380±130.

Under the interdisciplinary research activities, the Institute worked in collaboration with Geological Survey of India; Oil and Natural Gas Commission, Dehra Dun; Indian Statistical Institute, Calcutta; Dibrugarh University, Assam; Directorate of Mineral Resources, Meghalaya; Geology Department, Lucknow University; Directorate of Geology and Mining, Nagaland; Neyveli Lignite Corporation; Archae-

ological Survey of India; Department of Ancient Indian History and Archaeology, Kurukshetra; Botany Department, University of Texas, U. S. A.; Botany Department, University of Lyon, France; National Institute of Oceanography, Goa; Central Fuel Research Institute, Dhanbad; and Deccan College, Poona.

Training in palaeobotanical methodology and technical assistance on palaeobotanical and related problems was provided to a number of representatives of various Universities and Institutions from India and abroad.

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II. RESEARCH

1. PRE-GONDWANA

1.1. Vindhyan Supergroup

Some typical microfossils, including *Tasmanites*, *Leiosphaerids* and algal remains from the Pre-Cambrian of Ramapura, Madhya Pradesh have been studied by scanning electron microscope and also by fluorescence microscopy. These have helped to clarify the nature of some of these problematic ancient plant remains.

To study the microbiota from the Rewa area, sectioning of the 50 rock samples belonging to different formations of Vindhyan Supergroup was completed.

1.2. Aravalli Supergroup

A microbiota of the stromatolites collected from the rock phosphate deposits of Jhamarkotra, near Udaipur, Matoon Formation (2 b. y.) was studied and two types of biota were identified. The small, smooth cells show binary division of cells. The other type is bigger in size with thickenings.

1.3. Penganga Group

The study of the microbiota collected from the dolomites near Ghugus has been completed. This is the first report of biota from this bed. The specimens of acritarchs have also been studied under the scanning electron microscope.

1.4. Ganga Valley

The observations and photography of Ganga Valley

samples have been completed. The remains of colonial and filamentous algae have been recorded for the first time.

The drill core samples supplied by the Central Ground Water Board, Lucknow from Panki area, Kanpur were macerated but all samples proved to be barren.

For the search of organic remains in Pre-Cambrian shales, a series of optical tests were carried out, which helped to distinguish the synsedimentary microfossils from contaminants or artefacts. The technique comprises (i) study of the rock sections in dark field by incident light illumination and on a heating stage microscope (Fluorescence), (ii) study of thin sections in interference contrast, and (iii) examination of macerated and isolated specimens in Zermike-Phase-contrast and in Interference-contrast. Two young Pre-Cambrian shales, one from the Vindhyan of India and the other from the Bushimay System of Zaire, were tested by these techniques. The results show that both the samples contain microfossils of synsedimentary age.

1.5. Pre-Gondwana from Abroad

1.5.1. Studies of thin sections from the Pre-Cambrian (Lower Zaire, Shaba and Bushimay Formation) have been completed. They reveal the presence of colonial algae and spherical cells comparable to bacteria in size.

2. LOWER GONDWANA

2.1. Morphological studies in the Glossopteris Flora

2.1.1 *Pteridophytes : Morphology and variation in insitu spores in ferns*

Spores were isolated from the sporangia of the fern *Dizeugotheca phegopteroides* and about 125 spores were biometrically analysed. Parameters used were size and shape of

spore, tetrad mark and their orientation, number of ornaments along equator—their length and spacing. The study revealed that (i) monolete and trilete mark is found in oval and triangular forms respectively but circular grains have higher percentage of trilete than monolete, (ii) length of ornament and its spacing is very variable. The material has been prepared for SEM study.

2.1.2. *Gymnosperms*

A. A monograph on the revision of Indian species of *Glossopteris* was taken up. Feistmantel's type specimens from G. S. I., Calcutta were examined and sketched on 1 sq cm grid and the venation on 4 sq cm grid. New species of *Glossopteris* described by Pant and his co-workers and also other scientists from the Institute and other places were also similarly studied and sketched. From this study it appears that distinct taxa of *Glossopteris* could be precisely identified from the venation pattern and shapes of leaves. Furthermore, it appears likely that Karharbari, Barakar and Raniganj stages have distinct species of *Glossopteris*. Some of these species may serve as index fossils for the Lower Gondwana horizons.

B. Cuticular studies of two types of *Glossopteris* leaves of Raniganj Stage have been completed. The specimens were collected from Jambad Colliery, Raniganj Coalfield. Eight well-preserved, nearly completed specimens of leaf type–1 (open-meshed, narrow, elongate leaf) were studied for different exomorphic features. The cuticular characters of the leaves from apex, base and middle parts were also investigated; they are almost identical.

Six more or less complete specimens of leaf type-2 have been critically studied for their external and cuticular characters. The cuticles of the two leaf types are found to be

distinct. Each leaf type-2 is a broad spathulate form with narrow meshes.

C. Studies on the Barakar flora of Churulia Area, Raniganj Coalfield have been undertaken.

2.1.3. *Lower Gondwana Flora from Kamthi beds of Wardha-Godavari Valley*

A large number of fossil woods with preserved primary and secondary wood characters have been found in the Kamthi beds near Chanda, Madhya Pradesh. Among these, 6 genera have so far been identified, viz., *Dadoxylon* Endlicher, *Trigonomyelon* Walton, *Taxopitys* Kräusel, *Prototaxoxylon* Kräusel & Dolianiti; *Zalesskyoxylon* Lepekhina & Yatsenko-Khemelvesky, and *Australoxylon* Marguerier. The woods of *Taxopitys* and *Australoxylon* have been reported from India for the first time.

2.1.4. *Lower Gondwana Flora from South Karanpura Coalfield*

A rich material containing *Glossopteris* compressions from the Naditoli Seam, South Karanpura (Barakar Stage) has been investigated for *Glossopteris* cuticles. About 10 distinct species have been identified. The external morphological features of the leaf types have also been critically examined. Further, the new collections from the locality reveal the presence of certain interesting Arthrophyte remains.

2.2. Sporae dispersae and palynostratigraphy

2.2.1. *Morphology of Lower Gondwana spores*

Two stratigraphically important Lower Gondwana miospores, viz., *Plicatipollenites* and *Potonieisporites* have been biometrically and morphologically analysed. The variation

patterns in these two populations have been evaluated in time and space covering the Talchir to Barakar (Permian) span in five Lower Gondwana basins of India. Morphological and biometric criteria have been found to distinguish the two taxa and their variation limits. Parameters used for multivariate analysis were (i) miospores symmetry, (ii) tetrad mark, (iii) body-infold symmetry, and (iv) body symmetry. With the exception of body symmetry, all the other parameters show direct correlation in their trends. However, the results demonstrate that the 'Monosaccate Group' (*Plicatipollenites* population) is characterized by a strong association between radial miospore, trilete/triletoid mark and radial body-infold system. Contrarily, the 'Monosaccoid Group' (*Potonieisporites* population) is characterized by a strong association between bilateral miospores, monolete/monoletoid mark and bilateral-infold system. The Monosaccate Group shows a downward trend (regression) in time whereas the Monosaccoid Group indicates an upward trend (progression). A paper on the subject has been sent to press.

2.2.2. *Palynostratigraphy of Lower Gondwana in Hutar Coalfield, Bihar*

The Lower Gondwana sequence in the Hutar Coalfield has been geologically studied and some stratigraphically significant sections have been measured for palynostratigraphical investigations. Miospores from different horizons have been identified and partly photographed. About 32 species have been found in the Talchir. The Karharbari has 48 species while the Barakar contains 40 species. Results so far obtained seem to provide a basis for demarcating the boundaries between Talchir, Karharbari and Barakar formations of the area.

2.2.3. *Morphotaxonomic study of trilete genera*

A. The morphotaxonomic and stratigraphic study of the miospore genera of Varitrileti Group has been completed. The species of this group have been found diagnostic for each formation of Indian Lower Gondwana sequence. A monograph has been finalized on this group of spores and sent for publication.

B. *Morphotaxonomic study of a Saccate Group*

A study on *Corisaccites-Guttulapollenites* complex has been undertaken and a few specimens have been photographed. Further studies are under progress.

C. *Morphotaxonomy of Barakar miospores*

A detailed study of the specific delimitation of various miospores encountered in the samples from Barakar Formation is continued.

2.2.4. *Permo-Triassic palynology*

A. Seven samples from bore hole no. RD-1 (near Durgapur) East Raniganj Coalfield, Bengal were analysed. The floras recovered in two samples have suggested a Triassic age for this horizon. This analysis has confirmed the subsurface existence of Triassic strata in this region and consequently enhanced the possibility of the extension of coal bearing strata in this eastern-most region of the coalfield, which was not yet certain. A paper has been finalized and sent for publication.

B. Sixteen samples of bore hole RGR-4 East Raniganj Coalfield, representing Upper Permian horizon, have been macerated and slides prepared. Further detailed studies need more samples from the area.

C. Twenty samples from Tethyan Himalaya, Lepthal

and Spiti areas, representing Lower Gondwana, have been repeatedly macerated. The recovery of spores is very poor. Attempts to get mioflora from these samples were continued.

D. Slides prepared from one sample from the Raniganj type area, Raniganj Coalfield have been scanned again and some typical specimens have been photographed. The detailed morphographic study for specific delimitation has been undertaken.

E. A morphotaxonomic study of pollen and spores from Permian-Triassic sequence of Raniganj, West Bokaro, North Karanpura and Satpura basin has been taken up. The slides of samples have been scanned for typical specimens. Further study was continued.

2.2.5. *Giridih Coalfield, Bihar*

One sample each from Talchir, and from Lower and Upper Karharbari stages of the Giridih Coalfield were macerated. Slides were prepared, scanned and photographed. Detailed morphographic study for specific delimitations was continued.

2.2.6. *Siang District, Arunachal Pradesh*

One hundred and eight samples from the Gondwanas of Siang District were macerated. Sixty six samples proved to be productive and their slides were prepared. Well-preserved specimens were scanned and photographed. Detailed morphographic study for specific delimitation of various palynotaxa was continued. A note describing the overall palynological characteristics has been published.

2.2.7. *Wardha Valley Coalfield*

Eleven samples from the Talchir Formation were macerated and all proved to be unfossiliferous.

2.2.8. *Manendragarh*

Twenty seven samples from the Talchir Formation of Manendragarh were macerated. Miospores were recovered from 10 samples and that slides were prepared, scanned and photographed. Quantitative as well as qualitative estimation of various palynotaxa was done. Results of the study have been compiled for publication.

2.2.9. *Raniganj Coalfield, West Bengal*

Twenty three bore-core samples from Raniganj Coalfield, Burdwan District, West Bengal, sent by G. S. I. (Loc. No. 1835 and 1836), were macerated. Out of these, 18 samples yielded pollen and spores. In all, 72 spore-pollen slides have been prepared for morphotaxonomic study.

2.3. Petrology and palynology of Palaeozoic coals

2.3.1. *Study on macro-and microfragmental remains in the Permian coals of India*

The Permian coals of India have been formed from variety of macro-and microfragmental remains of fossil plants. The macrofragmental fossil entities are mainly derived from woods and barks of the Permian swamps. They appear to have been coalified into vitrain and fusain types by the coalification processes of 'vitrinization and fusinization'. A significant fact emerged from the analytical data of vitrinitic and fusinitic constituents is the characteristic feature of V/F ratio in Permian coals of India, which not only indicates certain coal properties but also helps in dating and correlating the coal seams. A paper on the work has been submitted for publication.

2.3.2. *Study on petrology and palynology of Godavari coals*

The investigation, which represent the plant derived

sediments, have been divided into three main objectives, viz. (i) determination of petrographic and palynological characteristics, (ii) description of the relationship of each sediment type of botanical and geological setting, and (iii) establishment of the equivalence of certain peat types with the lithotypes. Further, this study has indicated the history and present status of coal seam constituents in the Godavari basin.

2.3.3. *Study on source material of Gondwana and Tertiary coals*

An analytical survey of plant derived coal constituents has been made from several coal seams of Lower Gondwana and Tertiary coals to ascertain phytogenic source material of the coals, their trends in coalification path, rank and types for geological and technological evaluation. The finalization of the results is under progress.

2.3.4. *Study on petrographic nature of lithotypes*

Maceral composition of a large number of Permian coal lithotypes from various sources has been investigated. Systematic analysis of the lithotypes of different ranks reveals that except vitrain samples, none of the lithotypes occurs in pure form unlike that of Carboniferous coals. Clarain samples are invariably composed of vitrinite and inertinite macerals alongwith less percentage of spore content. The durain coals are always associated with bright and inert constituents. The fusains are not totally fusinaceous but usually contaminated with vitrinites. These are anomalies of standard nomenclature and classification of coals mainly based on Carboniferous coals.

2.3.5. *Biopetrological studies of Bokaro Coalfield, Bihar*

Coal seam samples from Kathara, Uchidih, Kargali, Bermo and Karo (top, middle & bottom) have been prepared

in the form of standard coal pellets for detailed microscopic studies. Morphographic structures and macerals have been studied and identified. General maceral analysis of the above seam samples has also been done. To record the important features of the coal, some photographs were taken.

3. MESOZOIC

3.1. Megafossil assemblages

3.1.1. *Triassic Flora*

A large number of shale samples from Nidpur have been macerated in bulk and many pinnules, seeds, scale-leaves and fructifications have been isolated. Further work on them is under progress.

3.1.2. *Jurassic-Cretaceous Flora*

A paper dealing with *Thinfeldia indica* Feistmantel, *Ginkgo rajmahalensis* (Shah & Jain) comb. nov., *Ginkgo*-like seeds, *Araucarites* sp. and *Strobilites* sp. from Pathargama, Rajmahal Hills, Bihar has been finalized and sent for publication. A detailed paper on Indian *Dictyozamites* including *D. falcatus*, *D. indicus*, *D. hallei*, *D. sahnii*, *D. feistmantelii* sp. nov. and *D.* sp., has also been sent for publication. Preliminary description of some species of *Pterophyllum* has been written and some text-figures have been drawn. Work on *Stachyotaxus* is under progress.

Papers on some pteridophytes and *Allocladus* from the Jabalpur Formation have been sent for publication. Three papers dealing with *Araucaria indica* (Sahni) comb. nov., *Satpuria sehoraensis* gen. et sp. nov. and *S.* sp.; *Pachypteris indica*, *Brachyphyllum eikaiostomum*, *B.* sp., *Araucarites cutchensis* and *Coniferocaulon rajmahalense*, *Ptilophyllum acutifolium*, *P. cutchense*, *P. institacallum*, *Taeniopteris spatulata*, *Pagiophyllum*

marwarensis and *Araucarites minutus* have been finalized and sent to press.

Some species of *Ptilophyllum*, *Pterophyllum*, *Otozamites*, *Brachyphyllum* and *Elatocladus* collected from Vemavaram have been photographed.

Compilation of a monograph on the Lower Cretaceous Flora of India is under progress. Work on *Gleichenia nordenskioldii* has been taken up.

A paper on the evaluation of *in situ* spores and pollen grains from the Jurassic-Cretaceous fructification has been submitted for publication.

3.2. Sporae dispersae and palynostratigraphy

3.2.1. *Triassic palynoflora*

The study of miospores from the Son River Section between Tharipathar and Ghiar has been completed and sent for publication. The study has revealed the presence of 47 species of miospores. Stratigraphically important taxa in the assemblage are *Aulisporites astigmosus*, *Camerosporites secatus*, *Duplicisporites granulatus*, *Granuloperculatipollis* spp., *Enzonalasporites densus*, *E. ignacii*, *E. vigens* and *Staurosaccites*. A paper on the age of the Tiki Formation in the South Rewa Gondwana Basin has also been sent for publication. On the basis of the available palynological data, an attempt has been made to establish the miofloral succession in the Triassic of India. Nine successive palynological zones have been recognized. The paper on megaspores obtained from the Janar Nala Section near Harai in Shahdol District, Madhya Pradesh has been submitted for publication. The assemblage comprises 21 different types belonging to 9 genera, viz., *Banksisporites*, *Bokarosporites*, *Bacutriletes*, *Verrutriletes*, *Horstisporites*, *Erlansonisporites*, *Hughesisporites*, *Nathorstisporites* and *Trileites*. On the

basis of megaspore study an Upper Triassic age has been suggested for this plant bearing bed of the Tiki Formation.

3.2.2. *Jurassic-Cretaceous palynostratigraphy of India*

A. Some more slides from the Rajmahal Basin have been scanned. The presence of the genus *Appendicisporites* has been noticed.

B. Study of the palynofossils from the Lokhartalai area around Morand River, Madhya Pradesh has been continued. Of the 28 samples processed, only one yielded a good microflora comprising spores, pollen and dinoflagellates. The spores and pollen assemblage is dominated by gymnosperm pollen particularly *Callialasporites dampieri* and *Araucariacites australis*. The paper has been sent to press. The study of dinoflagellates is being continued. A detailed study of palynoflora from the Upper Gondwana of South Rewa Basin is under progress.

The study of mio-and magaspores from Trambau, Dharesi and Pipli has been continued. A large number of megaspores have been photographed in dry condition, differentially macerated and rephotographed in wet condition. Speciation of the Dharesi miospores is almost complete.

C. Study of palynology of the 'Kota' Formation has been continued. Some samples from the Vridhachalam and Pondicherry areas were palynologically examined and *Aquilapollenites* has been found. Photography of interesting specimens has been done.

3.2.3. *Palynostratigraphy of Mesozoic sediments of Sidheshwar Hills, Cuttack*

A good number of scanned miospores have been partly microphotographed. Further work is being continued.

3.2.4. *Palynostratigraphical study of Carbonaceous shales from Satpura Coal Basin, Madhya Pradesh*

Twenty four spore-pollen slides from Kotri have been scanned. Quantitative and qualitative analysis have been completed. The miofloral assemblage is composed of 31 miospore genera and it is characterized by having a predominance of podocarpaceous miospore genus *Callialasporites* followed by *Araucariacites*. Specifically, *Callialasporites dampieri* and *Araucariacites jabalpurensis* are the chief elements of the assemblage. The components belonging to pteridophytes, bryophytes, and Cycadales or Bennettitales are meagre in the assemblage. A paper has been submitted for publication.

Scanning of slides from Hathidoba is in progress.

3.3. Mesozoic coals from abroad

Ultrastructural studies of tricolpate pollen grains from the Triassic-Liassic sediments from Iran

A few more specimens of tricolpate pollen grains from Iran have been isolated and will be studied by SEM.

4. CENOZOIC

4.1. Morphological and anatomical studies

4.1.1. *Deccan Intertrappean Flora*

A large number of fossil woods belonging to palms and dicots collected from Nawargaon and Barwaha were cut and sections prepared. The Nawargaon dicot woods identified with the extant species of *Homalium* (Flacourtiaceae), *Evodia* (Rutaceae), *Amoora* (Meliaceae), *Bursera* (Burseraceae) and *Dūabanga* (Sonneratiaceae) were described and photographed. Those from Barwaha were identified to *Ailanthus, Aeschynomene* and *Tetrameles*.

Two palm woods were also studied in detail from Nawargaon. One of these compares very closely with the modern wood of *Livistona chinensis*. This was photographed and described in detail. A paper is almost finalized for press.

To study the anatomical variations in a palm stem and to identify the fragments of fossil palm woods assigned to the artificial genus *Palmoxylon*, a detailed anatomical study of the middle region of *Caryota sabolifera* was carried out and transverse and longitudinal sections at different levels from dermal, subdermal and central zones were prepared.

Reinvestigation of the genus *Viracarpon* Sahni was taken up. All the descriptions and illustrations of the 5 species of this genus, viz., *Viracarpon hexaspermum* Sahni, *V. elongatum* Sahni, *V. sahnii* Chitaley *et al.*, *V. chitaleyi* Patil, and *V. tenui* Sahni were critically examined. *Viracarpon hexaspermum* and *V. elongatum* appear to be two distinct species and *V. sahnii* and *V. chitaleyi* seem to be their duplicates showing variable features. Two complete available specimens of *Viracarpon hexaspermum* were also studied by preparing peel sections. A thin section was also prepared and photographed. The study is in progress and attempts have been made to procure the fruits of *Pandanus* for comparison.

4.1.2. *Leaf-impressions from Laki Series, Kutch*

Leaf-impressions from the Eocene of Panandhro Basin were identified with the modern species of *Pandanus*, *Cinnamomum*, *Lagerstroemia*, *Syzygium*, *Terminalia* and *Ficus*.

4.1.3. *Leaf-impressions from Khari River Bed*

Leaf-impressions of *Bauhinia*, *Cinnamomum*, *Murraya*, *Millettia* and a palm identified from the Miocene of Khari River Bed were photographed, described and text-figures prepared.

4.1.4. *Fossil woods from Kankawati Series (Manchar) of Kutch, Gujarat*

Fossil woods from the Pliocene of Dhaneti and Mothala were identified to *Pterospermum, Sterculia, Terminalia* (2 spp.), *Afzelia-Intsia, Millettia-Pongamia, Albizia, Cynometra, Isoberlinea, Dipterocarpus* (2 spp.), and *Nephelium-Xerospermum* from the Pliocene of Dhaneti and Mothala in Kutch District and photographed and described in detail and the manuscript prepared. However, the leaf-impressions and the fossil woods from Kutch depict an entirely different picture of vegetation during the Tertiary times.

4.1.5. *Fossil woods and leaf-impressions from the Lower Siwalik beds*

A. A paper on the fossil woods of *Polyalthia, Anisoptera, Dipterocarpus, Cassia, Cynometra,* and *Diospyros* from the Siwalik beds of Kalagarh was completed and submitted for publication. A fresh collection of petrified woods from the Lower Siwalik beds of Uttar Pradesh was also worked out and new species of *Anisoptera, Dipterocarpus, Diospyros, Terminalia* and a wood belonging to Anacardiaceae were identified. Another paper on the petrified woods of *Careya, Dracontomelum* and *Afzelia-Intsia* from the Lower Siwalik beds of Nalagarh was completed and sent to press. Presence of Dipterocarps and other associated plant remains indicates the existence of evergreen forest all along the foot hills of North India during the late Tertiary period.

B. A leaf-impression from the Lower Siwalik beds of Tanakpur belonging to the genus *Persea* of Lauraceae was identified and a paper was submitted for publication.

4.1.6. *Fossil woods from Eastern India*

A. *Tipam Series*

The description and photography of 8 fossil woods

comparable to *Calophyllum pulcherrimum*, *Shorea talura*, *S. tumbuggaia*, *Dipterocarpus*, *Melanorrhoea torquata*, *Sindora siamensis*, *Artocarpus chaplasa*, *Lagerstroemia venusta* and *L. parviflora* was completed. A banded fossil wood probably of Rubiaceae or Celastraceae was also photographed. Further work is under progress.

Thin sections of 50 fossil woods from Gaglacherra of Assam were prepared and the fossil woods of *Gluta*, *Mangifera*, *Calophyllum* and *Dipterocarpus* were recorded from this locality. A new fossil wood comparable to *Lagerstroemia hypoleuca* and *L. parviflora* was studied and photographed. From a collection made from Nailalung about 25 fossil woods were also cut. Further study is being continued.

B. *Dupitila Series*

From the petrified woods collected from Namsang River Bed at Deomali in Arunachal Pradesh, three modern genera were identified as *Sterculia* (Sterculiaceae), *Millettia-Pongamia* (Leguminosae) and *Canarium* (Burseraceae). Besides, more lauraceous and dipterocarpaceous woods were tentatively identified.

4.1.7. *Fossil woods from the Cuddalore Series*

The investigation of the petrified woods from near Pondicherry revealed the occurrence of more dipterocarpaceous woods in the Cuddalore sandstones. One of them is very characteristic of the genus *Vatica* and is being studied in detail with a view to find out its nearest modern equivalent. A paper dealing with three leguminous woods, viz., *Albizinium pondicherriensis* sp. nov., *Cassinium arcotense* sp. nov. and *Pericopsoxylon indicum* gen. et sp. nov. was submitted for publication. Another paper describing fossil woods of *Sterculia* and *Lagerstroemia* was finalized. These genera have been reported for the first time from this locality.

4.2. Sporae dispersae and palynostratigraphy

4.2.1. *Neogene miospores of India*

Out of 153 polleniferous lignite samples collected from Neyveli lignite mine, 20 samples were macerated and slides were prepared, scanned and the miospores photographed. A systematic study revealed the presence of angiospermous, pteridophytic and fungal spores. Some miospores recovered earlier were compared with the pollen grains of extent species and confirmed as *Polypodium, Sclerosperma, Canthium* and *Ctenolophon.*

4.2.2. *Palynopetrographic study of organic remains of coastal and Up-country lignites*

A. Photomicrography and printing of a number of miospores recovered from Neyveli lignite (South Arcot District, Madras) samples were completed and rough plates were prepared. The recovered miospores were compared for their living affinities. A few new forms, viz., *Ctenolophonidites* (Ctenolophonaceae), *Droseracidites* (Droseraceae), *Alangiopollenites* (Alangiaceae), *Polygonacipites* (Polygonaceae), *Retitrescolpites* (Olcaceae), *Pistillipollenites* (Gentianaceae) and pollen grains with Cruciferous, Rubiaceous and Malvaceous affinity have also been recorded.

B. Maceral and microlithotype analyses of 12 pellets from four lateral sections (3 pellets from each section) of the Main Neyveli Lignite Seam have been completed. Establishment of microlithotype groups and statistical analysis of lignite has been undertaken. Photomicrography of the petrographic microconstituents has been completed. The reference study of the above 12 lignite pellets has also been completed.

4.2.3. *Palynostratigraphy and petrography of Tertiary coals of Upper Assam*

A. Counting of various miospores genera recovered from the samples of various collieries of Makum Coalfield (Upper Assam) was continued.

B. Compilation of palynopetrostratigraphical and geological studies on the Makum coal was in progress.

C. Statistical analysis of maceral and microlithotypes of 21 coal samples from Makum Coalfield was completed. Photomicrography of various coal microconstituents was completed and about 18 petrographic plates have been prepared. Histograms, charts and triangular diagrams were also drawn. This study of the coal revealed that it contains a very high percentage of vitrinite while inertinite and exinite constituents are very poor.

D. Comparative petrographic study of Jeypore and Makum coals has been completed. Photomicrography and preparation of charts and histograms was also completed.

E. Reflectance study was carried out on 23 coal pellets and one burnt coal pellet from Makum coal, 4 pellets from Jeypore coal, Upper Assam, one pellet of bitumen-like matter and one pellet of coal, both occurring as thin streaks in Tipam Formation.

4.2.4. *Palynological study of the Upper Cretaceous-Tertiary sediments of South Shillong Basin, Lower Assam*

Palynostratigraphic study of the Cretaceous-Tertiary sediments of South Shillong Basin has been completed. On the basis of a rich palynoflora studied from the seven measured sections of the Shillong Plateau, it has been possible to institute 3 biostratigraphical zones. Detailed morphological study of the palynomorphs has also been done. The results of the study have clearly demonstrated that the Gumaghat, Mahadeo and Langpar formations in Shillong Plateau can

be successfully demarcated by means of their characteristic palynological associations. The former two formations are of Maestrichtian age and reveal a gradual change in the composition of the palynoflora, perhaps due to a slow physiographic change in the basin of deposition, while the upper most Langpar Formation is distinguished by the typical Palaeocene spore-pollen and microplankton assemblages. Two papers on this study have been published.

4.2.5. *Palynostratigraphy of Tertiary sediments of Upper Assam*

A. Palynological zonation of the Neogene sediments of Nahorkatiya Basin was completed. The studies have indicated that the so-called unfossiliferous sequence of Girujan clays in Upper Assam Valley can be differentiated into three biozones, viz., *Cyathidites minor*, *Striatriletes girujanensis* and *Lobiplanktonia lobata* biozone. The palynological assemblages characterizing these zones have proved quite reliable in distinguishing the top, middle and bottom parts of the sequence. A paper on the work was completed and submitted for publication. Besides, morphological study of palynomorphs recovered from the Infra-Tipam sediments has also been undertaken.

B. A paper dealing with the palynostratigraphical study of the Siwalik sediments from the Kameng District (Arunachal Pradesh) was finalized and sent to press. This study reveals that the palynomorph assemblages are of mixed nature. The indigenous elements point out Miocene age whereas recycled elements from north and south indicate that the source rocks were of Lower Gondwana and Disangs respectively.

C. A study of the spore morphology of *Ceratopteris thalictroides* (L.) Brongn. from different localities of Assam,

West Bengal, Kerala, Orissa and Lucknow was carried out. Variation in morphological characters of the spores has been studied and recorded. An attempt has also been made to analyse morphological characters of some species of *Cicatricosisporites* and other forms from the Tertiary rocks of Assam which apparently have similar morphology as studied in the spores of *Ceratopteris thalictroides*.

4.2.6. *Palynology of the Tertiary sediments of Lower Assam*

A. *Resolution of the age of Barail equivalent rocks of Garo Hills*

Mioroscopic study of the palynomophs obtained from Someswari River, Dareng River and Tura-Dalu Road Sections was continued.

Detailed palynostratigraphical investigations of the Mikir Formation were worked out and the results of the study were submitted in a Ph. D. thesis.

B. *Palynostratigraphy of the Jowai-Badarpur Road Section*

Laboratory processing of palynostratigraphically located rock samples from the Jowai-Badarpur Road Section in the districts of Jaintia Hills (Meghalaya) and Cachar (Assam) was continued for the recovery of palynomorphs. Initial study shows that the assemblages contain spore-pollen together with reworked Permian elements.

4.2.7. *Palynostratigraphy of the Lower Tertiary sediments of Simla Hills and near Jammu, North India*

A. Palynological zonation of the Subathu Formation (Upper Palaeocene-Upper Eocene) at its type locality, Subathu Town, in the Kalka-Simla area has been completed. On the basis of qualitative and quantitative distribution of

the palynoflora, the Subathu Formation has been divided into 8 cenozones and two subzones. In descending order of stratigraphy, the cenozones are : *Todisporites* spp. Cenozone, *Subathu sahnii* Cenozone, *Cordosphaeridium multispinosum* Cenozone, *Hexagonifera* spp. Cenozone, *Homotryblium* spp. Cenozone, *Cleistosphaeridium* spp. Cenozone, Barren Zone and *Cyclonephelium* spp. Cenozone. Distribution of these cenozones has proved useful in identifying various stratigraphical levels of sequence in the area of investigation.

B. A new genus *Subathua* has been instituted for a dinoflagellate cyst from the Subathu Formation, Simla Hills. Under this genus two new species have been described and illustrated. *Subathua* apparently resembles *Thalassiphora* but differs from it in having distinct morphological characters and organization. It has been observed that *Subathua* is distributed in high frequency in the Upper part of the formation. Its palaeoecological significance has also been worked out.

4.2.8. *Palynostratigraphy of Marine Cretaceous-Tertiary sedimentary rocks near Pondicherry, Tiruchirapally and Quilon, South India*

A. *Microplankton study of Upper Cretaceous sediments*

Study of Upper Cretaceous dinoflagellates and acritarchs from Vridhachalam area has been completed. It describes 13 genera and 4 species of dinoflagellates and a single acritarch genus *Pterospermopsis*. The age of the assemblage has been concluded to be uppermost Maestrichtian, may be representing Maestrichtian-Danian transition. A paper has been submitted for publication.

Study of Nassellarian Radiolaria from phosphatic nodules has been completed and the manuscript entitled 'Polycystine Radiolaria from phosphatic nodules of Uttatur

Formation, South India (Part-I) Nassellaria' has been finalized. It includes 21 genera and 11 species. The assemblage is dominated by the members of the family Theoperidae with a few representatives of Amphipyndacidae, Artostrobiidae, Carpocaniidae, Pterocoryidae and Williriedellidae.

B. *Palynostratigraphy of Western Ghats (around Varkala & Quilon)*

Morphotaxonomical study of the fungal remains has been completed. It includes 17 genera and 19 species. Of these, 2 genera and 4 species are new. The assemblage is dominated by epiphyllous microthyriacious forms. Results of the study have been sent for publication. Morphotaxonomical study of dinoflagellates, spores and pollen grains is in progress.

4.2.9. *Palynostratigraphy of the Eocene sediments of Kutch, Gujarat*

The palynological assemblages from Naredi Formation (Lower Eocene) and Harudi Formation (Middle Eocene) have been investigated. The Naredi palynological assemblage consists of 65 spore-pollen genera and 92 species while the Harudi Formation has yielded 26 genera and 30 species. On the basis of palynological taxa, *Triorites triangulus* Cenozone has been proposed for the Naredi Formation. The important taxa in the cenozone are *Cupuliferoipollenites ovatus* and *Cyathidites minor*. *Proxapertites microreticulatus* Cenozone has been proposed for the Harudi Formation. This Cenozone is characterized by the dominance of *Palmaepollenites kutchensis, Scantigranulites sparsus* and *Couperipollis kutchensis*.

Besides, fossil algae, viz., *Lithophyllum* and *Lithothamnium* have been studied for the first time from the Fulra Limestone (Middle Eocene) from the petrographic sections.

4.2.10. *Palynostratigraphy of Madh and Kakdi formations around Matanomadh, Kutch, Gujarat*

Palynostratigraphy of the Matanomadh Formation in the type area has been completed. The interpretation part of the work is in progress.

4.3. Tertiary from abroad

A. A paper describing fossil woods comparable to modern woods of *Shorea ovata* of Dipterocarpaceae, *Swintomia floribunda* of Anacardiaceae, *Albizia lebbek* of Leguminosae, *Careya arborea* of Lecythidaceae, *Lagerstroemia venusta* of Lythraceae and *Araucaria-Agathis* of Araucariaceae from the Tertiary of Burma was completed and submitted for publication. The fossil wood named as *Dipterocarpoxylon holdeni* was also described here as a species of *Cynometroxylon* Chowdhury & Ghosh belonging to the family Leguminosae.

B. Fossil woods from the Tertiary of Congo sent by the Musee Royal de l'Afrique Centrale were cut and sections prepared.

5. QUATERNARY

5. 1. Plant megafossils from Karewa beds of Kashmir

Photography and description of fern leaves of *Pteridium* and seedlings somewhat resembling *Pinus* was completed. Duplicate specimens of leaf-impressions already described by Puri were sorted out for reinvestigation.

5. 2. Pollen morphology

Pollen morphological studies of 25 Indian species of Ebenaceae have revealed that the family shares affinities with Styraceae, Symplocaceae and Sapotaceae and support the segregation of the genera *Diospyros* and *Maba*. A paper on the studies was finalized and submitted for publication.

Three hundred and sixtyfour pollen slides of 91 taxa ot Lahaul and Spiti were prepared and pollen diagnoses of 54 species (Rosaceae 13, Polygonaceae 10, Compositae 25, Scrophulariaceae 6) completed. One hundred and eighty four pollen slides of 46 species of Ladakh Flora were prepared and studied. Pollen morphology of 50 taxa of Himachal Pradesh, 12 of Rajasthan desert—Amaranthaceae and Acanthaceae, and 10 of the Shola forest has been studied. A workable pollen key for the identification of Shola forest constituents has also been prepared.

5.3. Pollen analysis

5.3.1. *Pollen zonation scheme for Western Himalaya, Rajasthan, Gangetic Plain and Nilgiris*

A. *Kashmir Valley*

From the lithological correlation of sections exposed at Hirpur, Nadpur and Shirmal in the Shopian area, the lacustrine, fluvial and glaciofluvial successions have been inferred in Lower Karewa sedimentation. Some valleys developed initially under glacial conditions were later modified by fluvial activity. Three river terraces in this region suggest events of down cutting and valley widening possibly related with climatic fluctuations and tectonics. Pollen evidence shows open mixed conifer forests.

The biogenic deposit in the Tsokar lake dated earlier to 30, 600±1400 (BS-17) has been dated to 34,170±3,370 (BS-17) in TSD-1 profile. Warm fluctuation indicated by the deposit seems synchronous with the one reported from the Weichselian of Europe. Attempts are under progress to reconstruct the stratigraphy of the lake.

The Haigam lake pollen diagram believed to date from about 5,000 years ago has proved to be younger in age (BS-37 2,120±110, BS-36 1,640±115) based on samples

collected in 1963. Local pollen zones have been considered in all the pollen diagrams constructed from the Kashmir Valley. The study was continued.

B. *Himachal Pradesh*

The glaciofluvial activity in the soil profile from the Chandra River Bed at Batal in the Lahaul Valley proceeded 1,370 B.P. (BS-60) and the swamp here was formed much later.

During a recent visit to the Lahaul-Spiti area the glacial features and the altitudinal zonation of vegetation between 2,500 to 4,875 m were studied and 101 surface samples and 13 profiles from the glaciated 4,400 to 4,900 m were collected. Among the collections 340 plant species have been identified.

The European, Central Asian, Mediterranean and American elements in the high altitude flora, both from Ladakh and Lahaul-Spiti area, have been noted.

Pollen analysis of a clay sample from near Kalidhan, district Sirmur was completed and a paper was submitted for publication. The analysis has revealed open subtropical pine woods.

Pollen diagrams already published from Khajiar and Rewalsar in districts Chamba and Mandi respectively were considered for local pollen zonation. The vegetational stages already recognized have been retained as local pollen zones.

A draft was prepared dealing with the past and present distribution of *Larix griffithiana* in the entire Himalaya.

Five samples of Unchi-Bassi profile from district Hoshiarpur were pollen analysed. The non-arboreals were found to dominate over the arboreals.

C. *Garhwal Himalaya*

Thirty eight surface samples/moss cushions were pollen analysed from Sahasradhara, Kempti falls, Chakrata, Deo Ban, etc. and pollen spectra constructed.

D. *Kumaon Himalaya*

The pollen diagrams already constructed and published from Naukutchiya Tal and Bhim Tal were examined for pollen zonation. The vegetational stages recognized earlier have been retained as local pollen zones.

E. *U. P. Gangetic Plain*

The upper limit of zone HS-II in the Mendhata pollen profile has been radiocarbon dated to 4,380±130. A paper on the work was finalized and sent to press.

F. *Rajasthan*

Twenty eight surface samples from the Budha Pushkar area, Jaipur, Ajmer, Jaisalmer, Nagpur and Barmer were pollen analysed. Open vegetation is indicated by dominance of grasses, chenopods and Cyperaceae in the Budha Pushkar lake area. The deciduous *Anogeissus* forest is poorly represented. The dominance of grasses and sedges is recorded in other regions too.

The pollen analysis of 4 samples from Didwana profile was done and the dominance of grass and chenopod pollen was recorded.

The constructed pollen sequence dating from 9,560±150 (BS-51) from Kanod-Playa in Jaisalmer has revealed dominance of sedges over grasses till 8,700 yrs ago (BS-50), thereafter the grasses dominated. Stray pollen grains of *Capparis, Calligonum, Ephedra* and *Prosopis* have also been recovered.

From C-14 dates and pollen evidence the pathways for the Psammophytic scrub represented by *Calligonum polygonoides* have been constructed. From Lunkaransar, where present about 10,000 years ago, it reached Didwana by about 6,000 years ago, there from turning SE it reached Pushkar lake by about 3,000-4,000 years ago. A paper on the work was finalized.

In Rajasthan pollen diagrams, the large-sized grass pollen above 60 μ is not encountered before 3,000-4,000 years ago. A paper dealing with introduction of grasses with large size pollen in Rajasthan has been finalized.

From a survey of information on shifting cultivation practices in Western India it appears that the charcoal fragments in Rajasthan pollen diagrams were most probably derived from burning the tall perennial grasses unpalatable and injurious to the sheep and goat to induce fresh growth. The practice waned by about 3,000-4,000 years ago as a result of increased grazing pressure.

The environmental analysis of Holocene pollen from Rajasthan diagrams has enabled reconstruction of five plant communities which record minor fluctuations during the last 10,000 years. A paper on the work has been sent for publication.

Geomorphology and vegetation in the vicinities of Ranns and lakes from western and central Rajasthan desert were studied.

The alternating fluvial and lacustrine phases have been recognized in the laminated sand and clay beds in a profile at Pachpadra. Besides, one metre deep gypsum crystals indicating severe arid conditions, progressive increase in the angulate to subrotund sand grains coated with red colour

were observed. The basal sands and overlying kankar in Sujangarh profile suggest fluvial deposition followed by a lacustrine phase.

The lacustrine sediments in lakes, south of Pokaran, occur over gravel and sand beds indicating their formation from abandoned channels of an ancient river by sand dune activity. The Baramsar, Kanod and Kathori Ranns near Jaisalmer perhaps also originated in the same manner. Two papers have been finalized on the data based upon 3 m deep profiles. The contact of Budha Pushkar lake with the sand dunes has been mapped and an oxidised layer has also been observed at the base of a sand dune.

G. *Nilgiris*

Pollen spectra constructed from 6 surface samples and moss cushions from colgrain have revealed predominance of nonarboreals (grasses, composites, *Impatiens*, etc.) over the arboreals (*Eurya, Ternstroemia, Ligustrum, Sygygium*, etc.).

Pollen diagram constructed from colgrain depicts the open savannah in which grasses, *Impatiens, Artemisia* etc. record high values with the arboreals scantily present which increase towards the top of the profile. Considering the top and the bottom C-14 dates (BS-19, SE-23), consistent and reliable, the immigration of the Shola forest here would be dated about 8,000 years.

The pollen analysis of 8 samples from the upper Bhawani profile reveals sparse arboreal pollen. The sequence dates from 18,500 years (BS-53). As many as 6 local pollen zones together with local zonules have been indicated in the pollen diagram from Kakathope covering a period of last 40,000 years.

5.3.2. *Preparation of Atlas of Modern pollen flora, seeds and fruits*

Pollen diagnoses of quite a few species have been completed. One hundred and seventy pollen index cards have been prepared. One hundred and eight index cards of cereals, pulses, fruits, nuts, oil seeds and fibre yielding plants discovered in archaeological excavations have also been prepared together with notes on their distribution, ecology and ethnobotany.

5.3.3. *History of ancient plant economy in India*

Plant remains from the following seven archaeological sites were studied:

Manwan Dih (U. P.), Barudih, Oriup and Sonpur (Bihar), Pauni (Maharashtra), Prabhas Pattan (Gujarat), Lumbini and Khirti Ghat (Nepal).

The remains of cultivated strain of rice *(Oryza sativa)* have been identified at Manwan Dih, Barudih and at Lumbini; wild rice *(Oryza rufipogon)* at Oriup; cultivated rice, (*Phaseolus radiatus, P. mungo, Dolichos biflorus*) and a wild grass, (*Ischaemum* sp.) at Sonpur; *Dolichos* sp. and *Pisum sativum* at Prabhas Pattan; wild rice *(Oryza rufipogon)* and the Italian millet *(Setaria italica)* at Pauni.

Maps showing diffusionary trends within the country have been prepared for wheat, barley and rice.

Two papers were also prepared in arranging archaeobotanical data in the background of time scale dealing with commencement and progressive development of agriculture.

The plant remains of Non Nok Tha were studied and a draft was prepared.

5.3.4. *Plio-Pleistocene palynostratigraphy of Kutch, Gujarat*

Preliminary observations of the area have revealed the absence of *Ceratopteris* in Kutch, which was profusely present prior to Quaternary. Its extinction may well have a bearing

upon the climatic fluctuations during the early Quaternary. The study is under progress

5.3.5. *Bengal*

Pollen diagrams from Kolara, Barrackpore, Chaltiya and Namkhana in the Bengal Basin were prepared and stratigraphy of the basin constructed. The profiles date from about 7,000 years. The ecological distribution of plants has been shown in a diagram and a map of the area was prepared. The finalization of a paper is in progress.

5.3.6. *Meghalaya*

Six surface samples from Khasi and Jaintia hills were pollen analysed and pollen spectra constructed and compared with present day floristics. A paper on the work was submitted for publication.

6. RADIOCARBON DATING LABORATORY

The Radiocarbon Dating Laboratory has carried out measurements on 90 samples including anthracite background and Radiocarbon standard preparations during the year under review. A large proportion of the samples dated (total 48 samples) relate to various research projects of the Quaternary palynology. The measured ages of some of the samples and the salient features of the results obtained using the dates are as :

6.1. Quaternary samples

6.1.1. *Kashmir Series*

Four samples from a depth profile of Tsokar Lake, Ladakh have been dated. The lake dates before Weichselian glaciation. The biogenic deposit at 8 m depth dates to 34,200 yrs B.P. This seems to correspond to the deposit at

21.85 m of bore hole TP-6 which has been dated at 30,600 yrs B. P.

Clayey organic sediment samples collected from Haigam Lake, Kashmir have been earlier interpreted to date from Neolithic, i. e. about 5,000 yrs B. P. on the basis of pollen sequence. The C-14 dates of the samples at 4-5 m and 5-6 m depths are 1,600 yrs B. P. and 2,120 yrs B.P. respectively.

6.1.2. *Lahaul Series*

Silty clay samples from trial trench along river bed at Batal (Himachal Pradesh) have been dated. The base of the profile at 1 m depth dates to 1,400 yrs B. P. The ages of two top samples do not correlate with depth.

Two fractions of a sediment sample from Mari, Kulu District were dated to demonstrate the effect of contamination due to fine rootlets.

Varved clay samples from Leedang, Spiti Valley have also been dated. The age of the samples at 2 m depth is 24,000 yrs B.P.

6.1.3. *Rajasthan Series*

Samples collected from trial trenches near the lakes of Rajasthan have been dated. The profile from Didwana Salt Lake dates back to 8,000 yrs B.P. at 3 m depth. The dates are consistent with depth giving a uniform sedimentation rate of 3.75 cm per 100 yrs. The earlier from this site has a single date at 1.25 m, in agreement with the present measurements.

Two samples of sandy clay deposits from Kanod Playa have been dated to 8,700 yrs B.P. and 9,570 yrs B.P. respectively. The age of the bottom deposit agrees with those from some salt lakes in the North of Rajasthan desert.

6.1.4. *Nilgiri Series*

To trace the history of vegetation and climate of *Nilgiri Hills* samples were dated. Of the 4 samples from upper Bhawani profile, two have been dated (1.4 m depth one dated to 5,700 yrs B.P. and 2.15 m depth one dated to 18,540 yrs B.P.). A hiatus seems involved here in the stratigraphy. The upper two samples were being processed for age measurement.

6.2. Geological/Geophysical samples

Samples of lignite and wood from Allepy, district Kerala, (submitted by G. S. I.) for locating new occurrences of lignite in the area were dated. The ages range from 24,000 yrs B.P. to 40,000 yrs B.P.

An age of 39,000 yrs B.P. measured on a sample of wood 6 m below surface at Nirgudsar, Poona (sent by Prof R. V. Joshi, Deccan College, Poona) confirms the earlier finding that during the early part of the late Pleistocene, the streams in Western Maharashtra had deeply entrenched courses probably in response to epeirogenic movements affecting the Deccan peninsula.

Nine coral samples from around Minicoy Island collected by N.I.O., Goa for a study of island formation and storm beaches were dated. The dates lie in two groups, i. e. 2,000-3,000 yrs B.P. and 500 yrs B.P. to modern. The grouping of dates indicate the occurrence of a number of geophysical events in the area as inferred by N.I.O. collection and dating of more samples pertaining to the problem has been suggested to N.I.O.

In addition, the Laboratory has carried out age measurements on a number of samples of archaeological importance, Neolithic and Megalithic cultures of Tamil Nadu, cultural

sequence of Assam, Buddha period site at Lumbini, Nepal and early historical site at Ayodhya etc.

A compilation of age measurements carried out by Laboratory since it became operational with brief comments pertaining to the dates and date given by submitter has been finalized and sent for publication.

6.3. Development of the Laboratory

A. The electronics unit constructed by the Laboratory has been connected to the Counter for regular measurements. The services of the unit were satisfactory.

B. An uninterruptible power supply system with a set of storage batteries has been added to power the counting units. This enables the counting of samples without any interruption due to power failures.

C. Use of molecular sieves (Type-3A) for moisture absorption in both combustion and synthesis lines has been tested and found satisfactory. A number of trial runs of background and standard have been made. With the use of molecular sieves there is a considerable saving in the requirement of liquid nitrogen for the processing of samples.

6.4. Glass Blowing and Workshop

Major alterations in the Vacuum lines and repair jobs have been carried out in the Glass Blowing Section.

The Workshop also provided a valuable assistance in the maintenance and repair of equipments. During the year, a band saw cutting machine, bending machine and a number of measuring instruments and tools have been procured for the Workshop.

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IV. FIELD WORK

1. Two members of the Palaeozoic Department visited the Anukpur area, Madhya Pradesh in February, 1978 for measuring Talchir-Karharbari Section for the palynostratigraphic sampling.

2. One member of the Palaeozoic Department in February-March, 1978 visited Jhamarkota, Matoon Formation, Aravalli Supergroup to collect stromatolites from rock phosphate beds for microbiota studies.

3. One member of the Palaeozoic Department visited and collected samples from Vindhyan Supergroup of Sapotra-Karauli Section in February-March, 1978.

4. Three members of the Palaeozoic Department visited the Chandrapura and Nagpur area in March, 1978 for collection of megafossils from Kamthi beds and palynological samples from the Lower Gondwana.

5. One member of the Palaeozoic Department visited Raniganj Coalfield in February, 1978 for collection of pteridophytic megafossils from the Raniganj and Barakar stages.

6. Four members of the Mesozoic Department visited various localities in Rajasthan and Gujarat during 22nd February to 10th April, 1978. Plant megafossils, petrified woods and palynological samples have been collected.

7. One member of the Mesozoic Department went on an excursion to Madhya Pradesh on 31st March, 1978 for the collection of megafossils from Narsinghpur area.

8. A member of the Mesozoic Department visited Glen Rose Formation in Central Texas.

9. A field trip was undertaken by two members of the Coal Department to East and West Bokaro Coalfield, Bihar during February-March, 1978 and collected coal samples from 1 to 14 seams from West and 1 to 12 seams from East Bokaro Coalfield and measured 6 geological sections in the area.

10. One member of the Coal Department visited C.F.R.I. Dhanbad for discussion on coal typological analysis, supply of bore-core samples and chemical data of the samples collected.

11. Four members of the Coal Department visited the Jharia Coalfield in February-March, 1978 to collect Lower Gondwana sequence in outcrop section and from collieries.

12. Two members of the Coal Department visited some Mesozoic localities, viz., Sehora, Marhipiparia and Bijori in Narsinghpur District and Lametta Ghat and Patbaba ridge in Jabalpur District, Madhya Pradesh for the collection of sedimentary rock samples.

13. One member of the Coal Department visited Central Petrological Laboratory, G. S. I., Calcutta for reflectance study on coal and lignite.

14. One member of the Cenozoic Department visited National Institute of Oceanography, Goa in August, 1977 and collected samples for investigation. He again visited Goa in November-December, 1977 for about twelve days and collected 110 modern plants with flowers for comparative studies.

15. One member of the Cenozoic Department went on an excursion to Lower Siwalik beds near Nalagarh in Himachal Pradesh during October-November, 1977 and made a rich collection of fossil woods.

16. Three members of the Cenozoic Department visited Forest Research Institute, Dehradun in November-December, 1977 and consulted Xylarium and Herbarium of the Institute for the identification of fossil plants. A collection of fossil woods from the Siwalik beds of Kalagarh was also made during this trip.

17. Four members of the Cenozoic Department also went to various Tertiary fossil localities of North-eastern India and made a rich collection of fossil plants from near Hailakandi, Nailalung and Bimlapur in Assam, Borjan Drilling camp near Naginimara in Nagaland, Deomali in Arunachal Pradesh and Bolpur in West Bengal.

18. An excursion to Cauvery Basin was undertaken by two members of the Oil Palynology Department from 4 March to 24 March, 1978. The stratigraphically located samples were collected from localities near Ariyalur, Vridhachalam, Uttatur, Karai and Kallakudi.

19. One member of the Oil Palynology Department went on an excursion in December, 1977 to January, 1978 to collect palynological samples from measured sections around Sri Kolayatji, Rajasthan and in Kutch, Gujarat.

20. Two members of the Oil Palynology Department visited Assam and Meghalaya during January-February, 1978. An extensive collection of rock samples for palynological investigations from the Palaeocene-Miocene succession in Jowai-Badarpur Road Section was made. A systematic study of the stratigraphy of the area was also carried out.

21. Two members of Quaternary Department visited Nilgiris in February, 1978 and collected surface samples, pollen profiles, modern plants and observations on nature and distribution of vegetation types.

22. Two members of the Quaternary Department visited Rajasthan desert in February-March, 1978 for geomorphological studies and collected surface samples, pollen profiles and modern plants.

23. One member of the Quaternary Department visited Lahaul-Spiti area alongwith the members of G. S. I. and collected material. He also visited the Herbarium of Indian Botanical Gardens, Howrah and about 340 plants from Lahaul-Spiti area were identified.

V. SPONSORED/COLLABORATIVE RESEARCH

A. PALAEOZOIC DEPARTMENT

(i) Collaborative research study with ONGC, Dehra Dun on subsurface samples of Ganga Valley is under progress.

(ii) Collaborative research work with Central Water Board, Northern Circle, Lucknow on Panki drill cores of Uttar Pradesh is continued.

(iii) Collaborative research work with G. S. I., Western Circle and Central Circle on Vindhyan Supergroup is under progress.

B. MESOZOIC DEPARTMENT

(i) Research work with Mr T. S. Kutty, Geology Section, Indian Statistical Institute, Calcutta on the palaeobotany and palynology of the 'Kota Formation' has been completed.

(ii) Collaborative work with Professor T. Delevoryas, Chairman, Department of Botany, University of Texas, Austin, U.S.A. on elucidation of Mesozoic Cycadophytes is under progress.

(iii) Collaborative work with Dr G. Barale, Botany Department, University of Lyon on some plant remains from Kali Gandhaki region, Nepal has been completed.

C. CENOZOIC DEPARTMENT

(i) A manuscript dealing with the fossil woods comparable to *Mammea, Cassia, Vitex, Stereospermum* and *Bequertiodendron* from the Tertiary of Blue Nile in collaboration with Prof Y. Lemoigne of Lyon, France was completed.

(ii) A paper on the leaves comparable to *Celtis australis, Malotus philippinensis* and *Prunus* sp. from the sub-recent clay deposits of Sirmur District, Himachal Pradesh with Mr A. P. Tewari and P. K. Swain, Geological Survey of India, Chandigarh was finalized and submitted for publication.

(iii) A collaborative work with Dr S. K. Dutta, Dibrugarh University on 33 pieces of petrified woods belonging to Namsang beds of Siang District was carried out. The fossils were tentatively identified with the modern genera *Gluta, Shorea, Albizia, Cynometra, Bauhinia, Cassia, Afzelia-Intsia* and ? *Sapindus*. Further work is under progress.

(iv) A collaborative work with N.I.O., Goa on palynostratigraphical investigations of the Continental shelf of Bombay collected by R. V. Gaveshani IInd oceanographic cruise, 45 Grab samples yielded spores, pollen and acritarchs. The work is in progress.

(v) Under a collaborative research work with N.I O., Goa on palynostratigraphical investigations of the core samples (Arabian Sea), collected by R. V. Oceanographer, the samples yielded hystrichosphaerids and acritarchs. The spore/pollen grains are poorly represented. The work is in progress.

D. COAL DEPARTMENT

Geological Survey of India, Coal Survey Stations

(C.F.R.I.), Coal India Limited (CMPDI), Directorate of Geology and Mining, Nagaland; Neyveli Lignite Corporation and International Coal and Lignite Nomenclature and Analysis Commissions of I.C.C.P.

E. OIL DEPARTMENT

(i) Biostratigraphical studies of phytoplankton in the marine Teritaries of Kutch and adjoining areas in collaboration with Geology Department, Lucknow University, are under progress.

(ii) Palynostratigraphical studies of Lower Tertiary rocks of northern India in collaboration with Geological Survey of India are under progress.

F. QUATERNARY DEPARTMENT

(i) Work on Quaternary palynology of Ladakh and Lahaul-Spiti areas in collaboration with Geological Survey of India is under investigation.

(ii) Archaeobotanical investigations based upon further materials from Archaeological Survey of India is under progress.

(iii) Quaternary palynology of archaeological sites based upon materials from Deccan College, Poona and Director of Archaeology and Museum, Hyderabad is under investigation.

VI. TRAINING PROVIDED TO OUTSIDERS

1. Mr Bindal, Department of Geology, Aligarh Muslim University, Aligarh.
2. Dr S. K. Roy and Mr. P. K. Ghosh, Department of Botany, Burdwan University, Burdwan.
3. Mr S. D. Bonde, Botany Department, University of Poona, Maharashtra.
4. Mr B. P. Patra, Utkal University, Bhubaneshwar.

VII. TECHNICAL ASSISTANCE TO OUTSIDERS

1. Geological Survey of India, Northern Circle, Eastern Circle, Western Circle and D.O.R.I.S., Rajasthan.
2. State Department of Geology and Mining, Jammu and Kashmir for the identification of Lower Gondwana plants.
3. Geological Survey of India.
4. Coal India Limited.
5. Coal Survey Stations (C.F.R.I.).
6. Neyveli Lignite Corporation.
7. Directorate of Geology and Mining, Assam and Nagaland.
8. Archaeological Survey of India.
9. National Seed Corporation, New Delhi.
10. Geological Survey of India.
11. Project Coordinator (Maize), IARI, New Delhi.
12. The International Rice Research Institute, Manila-Philippines.
13. Institute of South-east Asia Studies, Singapore.
14. Director, Archaeology and Museums, Jaipur.
15. Department of Botany, University of Dares-salaam, Tanzania.
16. Dr M. S. Randhawa, Kharar, Chandigarh.
17. AFPRO Geohydrological Investigation Team, Coimbatore.
18. Institute of Archaeology, London.

VIII A. PAPERS AND LECTURES AT SYMPOSIA/ CONFERENCES/MEETINGS

Bharadwaj, D. C. & Dwivedi, A.	A palynostratigraphic study of Lower Gondwana sediments from South Karanpura Coalfield, Bihar, India.	II Indian Geophytological Conference, Lucknow, 1978.
Delevoryas, T. & Srivastava, Shyam C.	A Jurassic flora from Honduras.	Botanical Society of America, 1977.
Garg, R. & Jain, K. P.	Polycystine Radiolaria from phosphatic nodules of Uttatur Formation, South India (Part-I). Nassellaria.	Seminar on 'Problems in Mesozoic and Lower Tertiary stratigraphy, palaeontology, sedimentation and palaeoenvironment, Lucknow University, Lucknow, 1978.
Jain, K. P. & Maheshwari, H. K.	Dinoflagellates from 'Non-marine' Upper Mesozoic sediments (Jabalpur Group), Madhya Pradesh.	II Indian Geophytological Conference, Lucknow, 1978.
Jain, K. P. & Tandon, K. K.	Dinoflagellate stratigraphy of Middle Eocene rocks of South Western Kutch, India.	Seminar on 'problems in Mesozoic and Lower Tertiary stratigraphy, palaeontology, se-

		dimentation and palaeoenvironment, Lucknow University, Lucknow, 1978.
Kar, R. K.	Fossil algae from Fulra Limestone (Middle Eocene), Kutch.	II Indian Geophytological Conference, Lucknow, 1978.
Khanna, A. K. & Singh, H. P.	*Subathua*, a new dinoflagellate genus and its palaeoecological significance in the Subathu Formation, Simla Hills.	Seminar on 'Problems in Mesozoic & Lower Tertiary stratigraphy, palaeontology, sedimentation and palaeoenvironment, Lucknow University, Lucknow, 1978.
Khan, H. A.	Contribution to the pollen morphology and taxonomy of Indian Capparaceae.	II Indian Geophytological Conference, Lucknow, 1978.
Khan, P. S. H., Pandey, A. K., Khan, H. A. & Singh, R. P.	Morphology and anatomy of seeds of *Crotalaria* sp.	II Indian Geophytological Conference, Lucknow, 1978.
Lakhanpal, R. N. & Guleria, J. S.	A lauraceous leaf-impression from the Siwalik beds near Tanakpur.	8th Himalayan Geology Seminar, Chandigarh.
Maheshwari, H.K.	Jurassic-Cretaceous	Seminar on 'Prob-

	palynostratigraphy in India : problems and prospects.	lems in Mesozoic & Lower Tertiary palaeontology, sedimentation, stratigraphy & palaeoenvironment, Lucknow University, Lucknow, 1978.
Maheshwari, H. K. & Pramod-Kumar	A Jurassic mioflora from the Jabalpur Group exposed in Morand River near Morghat, Hoshangabad District, Madhya Pradesh.	II Indian Geophytological Conference, Lucknow, 1978.
Maithy, P. K.	Pre-Gondwana biota of India.	65th Indian Science Congress, Ahmedabad in Symposium on 'Floristics of Indian Gondwana'.
Maithy, P. K.	Stromatolitic biota.	'Stromatolitic Workshop' held at Udaipur, 1978.
Navale, G. K. B. & Misra, B. K.	Comparative petrographic study of Jeypore and Makum coals.	II Indian Geophytological Conference, Lucknow, 1978.
Prakash, U.	Some more fossil woods from the Lower Siwalik beds of Himachal Pradesh, India.	8th Himalayan Geology Seminar, Chandigarh.

Pramod-Kumar Kulshreshtha, S. K.	Palynostratigraphical studies of carbonaceous shales from Kotri, Narsinghpur District, M. P., India.	II Indian Geophytological Conference, Lucknow, 1978.
Savithri, R. & Vishnu-Mittre	Diffusionary pathways for wheat, barley and rice in the Indian subcontinent.	II Indian Geophytological Conference, Lucknow, 1978.
Singh, H. P., Khanna, A. K. & Sah, S. C. D.	Palynological zonation of the Subathu Formation in the Kalka-Simla area of Himachal Pradesh.	8th Himalayan Geology Seminar, Chandigarh.
Singh, H. P. & Tripathi, S.K.M.	A study of the spores of *Ceratopteris thalictroides* (L) Brongn. and their fossil records in Assam.	II Indian Geophytological Conference, Lucknow, 1978.
Srivastava, Shyam C.	Permo-Triassic palynofloral transition in Indian subcontinent.	International Palynological Colloquium, Leon, Spain, 1977.
Srivastava, Shyam C.	Gondwana Palaeobotany in India.	Northern Arizona University, Flagstaff, Arizona and Brigham Young University, Provo Utah, USA, 1977.
Sukh-Dev	A new species of *Allocladus* from Bansa, Madhya Pradesh.	Seminar on 'Problems in Mesozoic and Lower Ter-

		tiary palaeontology, sedimentation & palaeoenvironment, Lucknow University, Lucknow, 1978.
Tiwari, R. S.	Palynological dating of subsurface Triassic strata near Durgapur, West Bengal.	II Indian Geophytological Conference, Lucknow, 1978.
Vishnu-Mittre	Cultivated plants in space and time.	Botanical Society, Kanpur.
Vishnu-Mittre	History of Modern Indian Flora.	Botanical Department, Burdwan University, Burdwan.
Vishnu-Mittre	Cultivated plants and cultural evolution.	Deccan College, Poona.
Vishnu-Mittre	Food grains in space and time.	Maharashtra Association for cultivation of science, Poona.
Vishnu-Mittre	History of modern Indian flora.	Botany Department, Poona University, Poona.
Vishnu-Mittre	The reconstruction of past environment through palynology.	Archaeological Survey of India, New Delhi.
Vishnu-Mittre	Archaeobotany and cultural evolution.	Archaeological Survey of India, New Delhi.

Vishnu-Mittre	Recent changes in environment.	Symposium on Drought and man, IFIAS Workshop, Ahmedabad.
Vishnu-Mittre	Flora, fauna and climate : Recent changes and their bearing upon inference of Quaternary environments.	National Seminar on Quaternary environments in Western India, Baroda.
Vishnu-Mittre	Possible significance of the late Quaternary charcoal fragments in Rajasthan pollen diagrams in the light of survey of modern practices of shifting cultivation and animal husbandry in Western India.	II Indian Geophytological Conference, Lucknow, 1978.
Vishnu-Mittre & Kar, R. K.	Is *Ceratopteris* a Quaternary casualty in Kutch ?	,,
Vishnu-Mittre, Rajagopalan, G., & Saxena, A. K.	Late Quaternary immigration pathways of the psammophytic dune scrub in the Rajasthan desert.	,,
Vishnu-Mittre, Rawat, B. S. & Bhattacharyya, A.	A botanical tour to the Lahaul-Spiti Valley of Himachal Pradesh.	,,

Vishnu-Mittre & Saxena, A. K.	History of exceptionallylarge-sized cereal type pollen in the Rajasthan desert.	II Indian Geophytological Conference, Lucknow, 1978.

VIII B. RADIO TALKS

Maithy, P. K.	Pre-Cambrian Jivan (Hindi).	T. V., Lucknow.
Vishnu-Mittre	Research trends in science and development.	AIR, Lucknow.

IX. REPRESENTATION ON COMMITTEES/BOARDS

Bharadwaj, D. C.	...	Member, International Commission on Carboniferous Stratigraphy.
	...	Member, Scientific Committees, International Geological Correlation Programme (UNESCO & IUGS).
	...	Member, Editorial boards of 'Review Palaeobotany and Palynology', 'The Palaeobotanist', and 'Geophytology'.
Bose, M. N.	...	Member, Editorial boards of 'Review Palaeobotany and Palynology', 'The Palaeobotanist' and 'Geophytology'.
	...	Secretary, Palaeobotanical Society (from January 1, 1978).

Gupta, H. P.	...	Member, Executive Committee, Palaeobotanical Society (till December, 1977).
	...	Member, Radiocarbon Dating Committee, B.S.I.P.
Jain, K. P.	...	Organising Secretary, II Indian Geophytological Conference.
	...	Member, Executive Committee, The Palaeobotanical Society (upto December, 1977).
	...	Member, Organising Committee, Ist International Palaeobotanical Conference.
Kar, R. K.	...	Joint Organising Secretary, II Indian Geophytological Conference.
	...	Joint Secretary, The Palaeobotanical Society.
	...	Founder Member, Indian National Earth Sciences Academy.
Lakhanpal, R. N.	...	Member, Editorial Board, 'The Palaeobotanist'.
	...	Vice-President, Palaeobotanical Society.
Maheshwari, H. K.	...	Member, Committee for Fossil Plants, International Association for Plant Taxonomy.
	...	Member, Editorial Subcommittee, IV I.P.C.
	...	Member, Organizing Committee, Ist International Palaeobotanical Conference, Palaeobotanical Society.

	...	Joint Organising Secretary, II Indian Geophytological Conference.
	...	Member, Executive Committee, Palaeobotanical Society (till 30 December, 1977).
Maithy, P. K.	...	Editor, Geophytology (till December, 1977).
	...	Member, International Working Group on Pre-Cambrian Biostratigraphy.
	...	Member, Working Group on IGCP Project No. 118, Upper Pre-Cambrian correlations.
Navale, G.K.B.	...	Member, International Committee of Coal Petrology.
	...	Member, Gondwana Coal Committee, ICCP.
	...	Member, International Commission on Coal and Lignite Nomenclature.
	...	Member, International Commission on Coal and Lignite Analysis.
	...	Member, Organising Committee of Indian Coal Petrology.
Prakash, U.	...	Chief Editor, 'Geophytology' (till December, 1977).
Singh, H. P.	...	Joint Secretary, Palaeobotanical Society (till December, 1977).
	...	Member, Editorial subcommittee, IV I.P.C.
	...	Convener, Audio-visual Committee, II Indian Geophytological Conference.

Srivastava, Shyam C.	...	Convener, Reception Committee, II Indian Geophytological Conference.
Tiwari, R. S.	...	Editor, 'Geophytology'.
	...	Member, Editorial Subcommittee, IV I.P.C.
	...	Member, National Working Group for International Geological Correlation Programme—Project 106, Permo-Triassic stage in Geological Evolution.
Vishnu-Mittre	...	Member, International Palynological Commission.
	...	Member, Central Advisory Board of Archaeology.
	...	Member, Committee to organise the National Museum of Man for Ministry of Education and Social Welfare.
	...	Member, Subsector Allergy and Applied Immunology, Science and Technology Department, State Council of Science and Technology, U. P.
	...	Member, Committee for Garhwal University for Programming studies and courses for Institute of Himalayan studies.
	...	Member, National Committee for Quaternary Environments in Western India.
	...	Member, Radiocarbon Dating Committee, B. S. I. P.
	...	Member, Ph. D. Committee, Gauhati University.

X. DEPUTATION/TRAINING/STUDY ABROAD

D. C. Bharadwaj

Visited Paris to attend the I.U.G.S. (UNESCO) meetings. He also went to Germany and acquainted himself with recent trends in coal research being carried out there.

P. K. Maithy

Under the Reinvitation-Programme by German Academic Exchange, West Germany, he visited the laboratory of Prof Dr H. D. Pflug, Geologisch-Palentologisch Institute, 63 GIESSEN to carry studies on the Pre-Cambrians of India and Zaire, (20th April to 5th July, 1977). A paper entitled 'Nachweis-verfahron fur organische Mikrofossilen in Prakambrischen Tonschiferen' (Proof of organic microfossils in Pre-Cambrian shales) was completed and submitted for publication. During this period of stay slides of Archean samples from Fig Tree Series, Africa, Molar Tooth Formation, Pre-Cambrian of Bohemia and the Nama Animal fossils (700 MY) from Africa were also examined.

On an invitation by Dr W. Palzelt, Director, LEITZ, Wetzaler Dr Maithy visited their factory and got acquainted with the modern modifications in the optical microscopes, scanning electron microscopes, dissecting microscopes and rotatory microtomes.

From 6th to 9th July, 1977 he worked in the Musee Royal de la Afrique, TERVUREN and completed a paper on 'Oncolites and Catagraphs from the Pre-Cambrians of Zaire (Lower Zaire, Shaba and Bushimay).' The paper has been submitted for publication.

Shyam C. Srivastava

Worked in the Department of Botany, University of Texas, Austin, USA on 'Jurassic plants from Honduras'. A

project on 'Elucidation of Mesozoic Cycadophytes' was also undertaken. While in USA, he visited the following laboratories.

Department of Botany and Coal Geology Laboratory, Ohio State University, Columbus, Ohio.

Department of Botany, Arizona State University, Tempe, Arizona.

Department of Biological Sciences and Geology, Northern Arizona University, Flagstaff, Arizona.

Department of Botany and Range Science, Provo, Utah

Biostratigraphical Laboratory of Texaco, Denver, Colorado.

Department of Palaeontology, University of California, Berkeley, California.

Palynology Laboratory, Chevorn Oil Field Company, La Habra, California.

Palaeochemotaxonomy Laboratory, New York Botanical Gardens, Bronx, New York.

Department of Biological Sciences, Peabody Museum of Natural History, Yale University, New Haven, Connecticut.

Palaeobotanical Laboratory of the Botanical Museum, Harvard University, Cambridge, Massachusetts.

US National Museum, Washington, D.C.

The following fossil localities were also visited by him during his stay in U. S. A.

Petrified Forest (Upper Triassic—Chinle Formation), National Park (Museum), Holbrook, Arizona.

Grand Canyon National Park (Hermit-Shale Flora), Arizona.

XI. HONOURS AND AWARDS

Archana Dwivedi ... Awarded Ph. D. Degree for her work on 'Palynology of the carbonaceous sediments in the Lower Gondwana deposits of South Karanpura Coalfield, India' from the Lucknow University.

R. Savithri ... Awarded Ph. D. degree for her work on 'Studies in archaeobotany together with its bearing upon socio-economy and environment of Indian Protohistoric cultures' from the Lucknow University.

Vijaya Rana ... Awarded Ph. D. degree for her work on 'Morphostratigraphical study of *Varitriletes* from Lower Gondwanas of India', from the Lucknow University.

XII. FOUNDER'S DAY CELEBRATIONS

The Founder's Day was celebrated on 14th November, 1977, the birthday of Professor Birbal Sahni, F. R. S.

In the morning wreaths and flowers were placed on the Samadhi of Professor Birbal Sahni.

In the evening at 5.30 p.m. Professor F. Ahmad, Commissioner, Geology and Mining, Srinagar delivered the 7th Birbal Sahni Memorial Lecture entitled, "Gondwanaland : the concept that failed".

On 15th November 1977 at 5.30 p.m. Professor K. A. Chowdhury, Centre of Advanced Study, Aligarh Muslim

University, Aligarh delivered the 25th Sir Albert Charles Seward Memorial Lecture entitled, "Plant anatomy and evolution".

Professor V. Puri, Institute of Advanced Studies, Department of Botany, Meerut University, Meerut delivered the 7th Silver Jubilee Lecture entitled, "The so-called primitive angiosperms" on 16th November, 1977 at 5.30 p.m.

XIII. PUBLICATIONS

1. The Journal 'The Palaeobotanist'

(a) Volume 24, numbers 1 to 3 were published during the year.

(b) Volume 25, a special 'Silver Jubilee Volume' was sent to Press. It comprises 52 invited papers from the distinguished palaeobotanists from all over the world.

2. Sir Albert Charles Seward Memorial Lecture

Twentyfourth lecture entitled "The tendency concept : a view focussed on the evolution in the Plant Kingdom" by Prof F. P. Jonker was published during the year.

The manuscript of the twentyfifth lecture entitled, "Plant anatomy and evolution" by Prof K. A. Chowdhury was sent to press.

3. Birbal Sahni Memorial Lecture

Sixth lecture entitled, "Mid-Cretaceous seed plants" by Mr N. F. Hughes was published during the year under review.

Manuscript of the 7th Lecture entitled, "Gondwanaland : the concept that failed" by Prof F. Ahmad was sent to press.

4. Silver Jubilee Commemoration Lecture

The manuscript of the 7th lecture entitled, The so-called primitive angiosperms" by Prof V. Puri was sent to press.

5. Revision of *Glossopteris* species from India—A Monograph

Twentytwo Plates and fiftyfour Text-figures were sent to M/s The Statesman Ltd., Calcutta for block-making and the ready blocks were sent to our printer M/s Catholic Press, Ranchi (Bihar).

6. Annual Report

Annual Report for the year 1976-77 was published and distributed to various Indian Universities, libraries and scientific Institutions.

7. Sale

A booklet containing the list of all Institute's publications, published so far by the Institute, was also published and sent to various Universities, libraries, firms and Institutions in India and abroad to promote the sales. During the year under review an income of Rs. 57,313.39 was registered from the sale proceeds of the Institute publications. The sum includes the following foreign exchange earned :

U. S. = 2,998.95

£ = 261.36

XIV. LIBRARY

1. Statement showing the details of stock for the year 1977-78

	DETAILS	POSITION ON 31.3.77	ADDED DURING 1977-78	TOTAL
(i)	Books	3052	131	3183
(ii)	Journals	6345	348	6693
(iii)	Reprints	23096	585	23681
(iv)	Microfilms	217	4	221
(v)	Theses	15	—	15
(vi)	Maps	40	—	40
(vii)	Reports	30	8	38

2. **Exchange Programme**

(i)	Number of papers purchased for exchange	29
(ii)	Total number of reprints sent out on exchange	5125
(iii)	Number of Institutions on exchange	62
(iv)	Number of individuals on exchange	347
(v)	Sets of papers of Professor Sahni's published work sent out	4

A number of scientific workers from India and abroad desiring to establish exchange relations with the Library have been included in the exchange list.

3. In addition to the Institute's scientific staff, the library services were also availed by the scientists from the Lucknow University; National Botanic Gardens; Jodhpur University; Aligarh Muslim University; G. S I., Lucknow; G. S. I., Madras; C. D. R. I., Lucknow; Utkal University, Orissa; Bose Research Institute, Calcutta; Wadia Institute of Himalayan Geology, Dehra Dun; University of Delhi; Burdwan University, West Bengal; Medical College, Kanpur; University of Poona, Pune; O. N. G. C., Dehra Dun and other local and outside research organisations.

4. The total number of registered users of the library went up from 91 to 97 this year.

5. During the year under review 26 important references were procured from the outside libraries and about 24 important publications were sent out to other libraries under the Inter-Library-Loan-Programme.

6. This year a few more racks have been added to arrange the literature in alphabetical order. The new arrangement enables more comprehensive open access.

7. Library received 5 Ph. D. theses from the Institute's members and one from abroad.

8. A number of out of print and old literature were reconditioned during the year.

XV. MUSEUM

A. Exhibition and Store Halls

1. *Geology Hall* (Hall No. 1)

All the show cases were properly cleaned and old labels and the legends of the show cases have been changed. The relief map of India and reconstruction models were also retouched.

2. *Botany Hall* (Hall No. 2)

Old labels and legends were replaced by new ones and all the show cases were properly cleaned and polished.

3. *Fossil Stores Hall* (Hall No. 3—Basement)

New collections have been stored in this Hall. During the year six more racks have been erected to accommodate the fresh collected fossils. The newly collected fossils were properly catalogued, numbered and stored as usual.

B. The Type and Figured specimens/slides etc.

The type and figured specimens so far kept in Professor Sahni's room have been shifted to Basement store-room. The position of type and figured specimens as on 31.3.1978 is as under :

Type and Figured specimens	1505
Type and figured slides	5884
Negatives of type and figured specimens and slides	3880

The checking of the type and figured specimens has been completed, while that of type and figured slides is under progress. More duplicate slides and specimens have been deposited by the scientific workers, during the year.

C. New collections

During the year collections have been made from about 130 localities of India by the Institute's staff. The details are as under :

Palaeozoic	...	245	specimens and samples
Mesozoic	...	525	,, ,,
Tertiary	...	680	,, ,,
Quaternary	...	205	samples
Oil Department	...	87	,,
Coal Department	...	409	,,

D. Specimens received for investigation

1. A palynological sample was received from the Director, Himalayan Geology Division, Northern Region, Geological Survey of India, Lucknow. The sample was investigated and results have been communicated to him.

2. For palynological investigations, a sample was received from Junior Geologist, Geological Survey of India, Eastern Region 12A and B, Russel Street, Calcutta. The report of the investigation has been communicated.

E. Presentation of Duplicate fossils

1. A fossil log was sent to Forest Botanist, Systematic Botany Branch, Forest Research Institute, Dehra Dun.

2. A set of 10 fossils was sent to Deputy Director, I.B.G., Botanical Survey of India, Botanical Gardens, Howrah.

3. A set of 11 fossils was sent to Head, Department of Botany, Gorakhpur University, Gorakhpur.

F. Visitors during the year

1. *Institutions*

(i) Guru Nanak Dev University, Botany Department, Amritsar.

(ii) Department of Botany, Berhanpur University, Berhanpur, Orissa.

(iii) Botany Department, School of Life Sciences, North Eastern Hill University, Shillong.

(iv) Botany students, A. S. N. M. Government College, Palakole, West Godavari District (A. P.)

(v) B. Sc. students, M. L. K. Degree College, Balrampur, Gonda.

(vi) Botany Department, University of Jodhpur, Jodhpur.

(vii) Botany Department, Cotton College, Gauhati.

(viii) Botany Students, S. S. L. Jain College, Vidisha, Madhya Pradesh.

(ix) Botany Department, Rajendra College, Chapra, Bihar.

(x) Botany Department, Institute of Science, Bombay.

(xi) Botany Department, Sibsagar College, Joysagar, Assam.

(xii) Botany Department, Gorakhpur University, Gorakhpur.

(xiii) Botany Department, Holkar Science College, Indore.

(xiv) Botany Department, Tata College, Chaibasa, Bihar.

(xv) Department of Geology, University of Udaipur, Udaipur, Rajasthan.

(xvi) Botany Department, Gaya College, Gaya, Bihar.

(xvii) Botany & Zoology Department, Darjeeling Government College, Darjeeling.

(xviii) Botany students, Indore University, Indore.

(xix) Geology Department, Tata College, Chaibasa, Bihar.

(xx) Tinsukhia College, Tinsukhia, Assam.

(xxi) Chemistry Department, North Bengal University, Darjeeling.

(xxii) Geology Department, Garhwal University, Srinagar, Garhwal.

(xxiii) Janta Inter College, Alambagh, Lucknow.

(xxiv) Botany students, M. M. College, Kanpur.

(xxv) Vishwabharti, Shanti Niketan, West Bengal.

(xxvi) Botany Department, Science College, Raipur.

(xxvii) Botany Department, Government P. G. College, Uttar Kashi.

(xxviii) Muscology students, Calcutta University, Calcutta.

2. *Individuals*

(i) Mr S. Chandra, Parke Davis (I) Ltd., Saki Naka, Bombay.

(ii) Mr S. C. Srivastava, S. A., A. G. U. P., Allahabad.

(iii) Miss Anita Sethi, Janakpuri, New Delhi.

(iv) Mr B. R. Dubey and party, Gwalior

(v) Dr P. S. Goel, I. I. T., Kanpur.

(vi) Mr Arvind Kumar Agarwal, Gandhi Nagar, Jaipur.

(vii) Major B. K. Mukherjee, AMC Surgeon, Indian Army.

(viii) Mr Jawahar Lal Tewari, Gorakhpur University, Gorakhpur

(ix) Dr S. P. Dhonkhadel, Tribhuvan University, Kathmandu, Nepal.

(x) Dr U. C. Bhattacharya, Botanical Survey of India, Howrah.

(xi) Angsuman Bandopadhyay, Raja Devindra Street, West Bengal.

(xii) Mr D. Hittner, French Embassy, New Delhi.

(xiii) Mr Y. S. R. K. Sharma, Prof & Head, Department of Botany, Banaras Hindu University, Varanasi.

(xiv) Mr A. K. Pande, Jamshedpur Cooperative College, Jamshedpur.

(xv) Dev. Cecil J. Saldanhe, St. Joseph's College, Bangalore.

(xvi) Mr V. V. Khanna, Ahmednagar College, Ahmednagar.

(xvii) Dr D. P. Singh, Department of Plant Physiology, Banaras Hindu University, Varanasi.

(xviii) Miss Meenu J. Khinusura, Poona University, Pune.

(xix) Mr J. S. Chauhan, Department of Plant Breeding, Pantnagar University, Pantnagar.

XVI. HERBARIUM

Herbarium specimens

Addition of plant specimens during the year	200
Total number of plant specimens as on 31.3.78	10,234

Fruit and Seed specimens

Addition of fruits and seeds during the year	2
Total number of fruits and seeds as on 31.3.78	1,810

Woods

Addition of wood specimens during the year	100
Total number of wood specimens as on 31.3.78	3,094

Wood slides

Addition of wood slides during the year	16
Total number of wood slides as on 31.3.78	2,518

Pollen slides

Addition of pollen slides during the year	1,500
Total number of pollen slides as on 31.3.78	9,725

Other slides

Total number of slides as on 31.3.78	4,632

Phyllothek

Addition of leaf specimens during the year	15
Total number of leaf specimens as on 31.3.78	148

About 300 identified plant specimens collected by a member of the Quaternary Department from Manali, Mari, Chetra, Chottodora, Batal Kaza etc., Himachal Pradesh were deposited in the Herbarium. A few erroneous identifications of plant specimens were also corrected in the light of recent nomenclature

For polleniferous material, the identification of about 150 plant specimens collected from Himachal Pradesh was done.

Two fruit specimens gifted to the Curator, Herbarium, during his visit to Botany Department, Sofia College Bhopal, Madhya Pradesh have been deposited in our carpothek.

One hundred wood specimens were received on exchange from the Centre Technique Forestier Tropical, 94130 Nogent-Sur-Marne, France.

Plant specimens have been received on exchange from the following organisations :

Botanical Survey of India, Southern Circle, Coimbatore	... 10
St. Joseph College, Bangalore	... 5

Twenty plant specimens were also sent under our exchange programme to the British Museum, U. K.

One pollen slide of *Parrotia jacquimontiana* was given on loan to the Palynology Section, National Botanic Gardens, Lucknow. A few wood specimens of *Juglans* sp. were given to the Department of Botany, Lucknow University, Lucknow with the condition that one slide of each species would be submitted to our Xylarium.

Rearrangement of Sporothek

All the available pollen/spore slides in the herbarium were rearranged region-wise in the 10 regions, viz., All India Collection (reference collection); Nilgiris and adjoining hill areas; South India including eastern and western Ghats; North-West and Central India; Malabar Coast; Upper Gangetic Plain; Assam and Meghalaya; Eastern Himalaya; North-West Himalaya; and Central Himalaya (Nepal).

In addition to these, the following regional sets were also made to study the regional pollen/spore flora in detail.

1. Foreign material
2. High altitude material
3. Mangrove material
4. Duplicate material

Under the study of foliar morphology of Hypericaceae and Clusiaceae about 16 leaves were cleared to study the venation pattern. Further clearing of more leaf specimens was under progress.

The following research workers of various Institutions/ organizations consulted the herbarium in connection with their research work.

1. Dr N. Nath,
   Regional Botanist,
   Botanical Survey of India, Howrah.
2. Dr Trilochan Singh,
   Scientist, Wadia Institute of Himalayan Geology,
   Dehra Dun.
3. Mrs Rashmi Srivastava,
   Department of Botany,
   University of Lucknow,
   Lucknow.
4. Prof Rev. C. J. Saldanha,
   Centre for Taxonomic Studies,
   St. Joseph College,
   Bangalore.
5. Miss Kiran Srivastava,
   Department of Botany,
   University of Lucknow,
   Lucknow.
6. Dr I. V. Doukelski-Teslenko,
   Institute of Geological Sciences,
   56b, Schkalov St., Kiev, USSR.

Routine matching, identification, poisoning, labelling, and repairing of herbarium specimens was continued.

XVII. BUILDING

Apart from general maintenance of the Building, the construction and electrification work of 3 lab-rooms on the

1st floor in the western wing and Maceration Block were completed. A reception/security room was also constructed at the main gate of the Institute during the year under review.

XVIII. GARDEN

Besides the routine maintenance of the garden, about 50 *Bougainvilleas* of different varieties were propagated by means of cutting and grafting. Further, 60 *Croton* plants were also propagated from the existing plants of the Institute by means of grafting.

The Institute garden was adjudged Second Best within its category in the city in a competition organized by the State Horticulture Department.

XIX. VISITORS

DISTINGUISHED VISITORS

1. Shri N. Appukuttan,
   Director(s),
   Department of Science & Technology,
   Technology Bhavan, New Delhi.

2. Shri P. K. Ramanujam,
   Financial Adviser,
   Department of Science & Technology,
   Technology Bhavan,
   New Delhi.

3. Dr U. G. Bhattacharya,
   Botanical Survey of India,
   Indian Botanical Gardens,
   Howrah.

4. Dr Cecil J. Saldanha,
St. Joseph College,
Bangalore.

5. Dr I. V. Doukelski-Teslenko,
Institute of Geological Sciences,
56b, Schkalov Street,
Kiev-54,
U.S.S.R.

XX. THE GOVERNING BODY, FINANCE & BUILDING COMMITTEE AND SCIENTIFIC PROGRAMMING & EVALUATION COMMITTEE

1. The Governing Body

CHAIRMAN

Professor T. S. Sadasivan, F.N.A.,
"Gokulam", 54, M.K.A. Koil Street,
Madras-600004 (till 3.1.1978).

Professor T. S. Mahabale, F.N.A.,
Maharashtra Association for the Cultivation of Science,
Pune-411004 (from 4.1.78)

MEMBERS

Mrs Savitri Sahni,
686, Birbal Sahni Marg,
Lucknow.

Director,
Botanical Survey of India,
P. O. Botanic Gardens,
Howrah-711103

Professor D. D. Pant, F.N.A.,
Head of the Botany Department,
University of Allahabad,
Allahabad.

Secretary to the Govt. of India,
Department of Science & Technology,
Technology Bhavan, New Mehrauli Road,
New Delhi-110029

Professor B. G. Deshpande, F.N.A.,
Head of the Geology Department (Retd.),
University of Poona,
Pune.

Dr D. Lal, F.N.A.,
Director,
Physical Research Laboratory, Navrangpura,
Ahmedabad-380009

Financial Adviser,
Department of Science & Technology,
New Delhi-110029

Director-General,
Archaeological Survey of India,
Janpath, New Delhi-110011

Director-General,
Geological Survey of India,
27, Jawaharlal Nehru Road,
Calcutta-13

Vice-Chancellor,
University of Lucknow,
Lucknow.

Professor B. S. Trivedi,
Botany Department,
University of Lucknow,
Lucknow-226007

Professor S. D. Saksena,
Vigyan Kutir,
Civil Lines, Rewa (M. P.).

Director,
Birbal Sahni Institute of Palaeobotany,
Lucknow (Member-Secretary).

Registrar,
Birbal Sahni Institute of Palaeobotany,
Lucknow (Non-Member-Asstt. Secretary).

2. Finance & Building Committee

CHAIRMAN

Professor T. S. Sadasivan, F.N.A.,
"Gokulam" M.K.A., Koil Street,
Madras-600004 (till 3.1.1978)

Professor T. S. Mahabale, F.N.A.,
Maharashtra Association for the Cultivation of Science,
Pune-411004 (from 4.1.1978)

MEMBERS

Dr Joseph P. John,
Principal Scientific Officer,
Government of India,
Department of Science & Technology,
New Delhi-110029

Financial Adviser,
Department of Science & Technology,
New Delhi-110029

Shri Sardar Husain,
Superintending Engineer,
39, Circle P.W.D., Gulistan Colony,
Lucknow.

Shri Naresh Kochar,
M/s Kochar & Associates,
16, Vidhan Sabha Marg,
Lucknow.

Professor D. D. Pant,
Head, Botany Department,
University of Allahabad,
Allahabad.

Professor K. R. Surange, F.N.A.,
Director,
Birbal Sahni Institute of Palaeobotany,
Lucknow.

3. Scientific Programming & Evaluation Committee

CHAIRMAN

Professor K. R. Surange, F.N.A.,
Director,
Birbal Sahni Institute of Palaeobotany,
Lucknow.

MEMBERS

Professor D. D. Pant, F.N.A.,
Head, Botany Department,
University of Allahabad,
Allahabad.

Professor B. G. Deshpande, F.N.A.,
Head of the Geology Department (Retd.),
University of Poona,
Pune.

Professor Rama,
Tata Institute of Fundamental Research,
Bombay.

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

Dr R. N. Lakhanpal,
Deputy Director,
Birbal Sahni Institute of Palaeobotany,
Lucknow.

Dr D. C. Bharadwaj,
Deputy Director,
Birbal Sahni Institute of Palaeobotany,
Lucknow.

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

Dr Vishnu-Mittre,
Head, Quaternary Palynology Department,
Birbal Sahni Institute of Palaeobotany,
Lucknow.

Dr Uttam Prakash,
Head, Cenozoic Palaeobotany Department,
Birbal Sahni Institute of Palaeobotany,
Lucknow.

Dr K. M. Lele,
Head, Palaeozoic Palaeobotany Department,
Birbal Sahni Institute of Palaeobotany,
Lucknow.

Dr H. P. Singh,
Head, Oil Palynology Department,
Birbal Sahni Institute of Palaeobotany,
Lucknow.

Dr G. Rajagopalan,
Head, Radiocarbon Dating Laboratory,
Birbal Sahni Institute of Palaeobotany,
Lucknow.

XXI. THE STAFF

DIRECTOR

Professor K. R. Surange, M.Sc., Ph.D. (Lucknow), Ph.D. (Cantab), F.Pb.S., F.A.Sc., F.N.A.

DEPUTY DIRECTORS

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

Dr D. C. Bharadwaj, M.Sc., Ph.D. (Lucknow), Dr rer. Nat. (Bonn), F.B.S., F.Pb.S.

DEPARTMENT OF PALAEOZOIC PALAEOBOTANY

Dr K. M. Lele, M.Sc., Ph.D., F.Pb.S.
Dr P. K. Maithy, M.Sc., Ph.D.
Dr (Mrs) Shaila Chandra, M.Sc., Ph.D., F.L.S.
Dr A. K. Srivastava, M.Sc., Ph.D.
Shri Manoj Shukla, M.Sc.
Dr J. P. Mandal, M.Sc., Ph.D.
Shri M. N. V. Prasad, M.Sc. (J.S.A. w.e.f. 5.12.77)
Shri D.E.P. Jeyasingh, M.Sc. (Research Scholar)

DEPARTMENT OF MESOZOIC PALAEOBOTANY

Dr M. N. Bose, M.Sc., Ph.D., F.Pb.S., Correspondent de l'arsom.

Dr Sukh Dev, M.Sc. (Hons.), Ph.D. (Lucknow), Ph.D. (Reading).
Dr H. K. Maheshwari, M.Sc., Ph.D.
Dr Shyam C. Srivastava, M.Sc., Ph.D. (S.S.O. w.e.f. 15.2.78)
Dr (Miss) Jayasri Banerji, M.Sc., Ph.D.
Shri K. P. Navaneetha Kumaran, M.Sc.
Miss Zeba Bano, M.Sc.
Shri B. N. Jana, M.Sc. (J.S.A. w.e.f. 5.12.77)

DEPARTMENT OF CENOZOIC PALAEOBOTANY

Dr U. Prakash, M.Sc., Ph.D., F.Pb.S.
Dr N. Awasthi, M.Sc., Ph.D.
Dr Anil Chandra, M.Sc., Ph.D.
Dr M. B. Bande, M.Sc., Ph.D.
Dr K. Ambwani, M.Sc., Ph.D. (S.S.A. w.e.f. 13.10.77)
Shri Jaswant Singh Guleria, M.Sc.
Miss C. Lalitha, M.Sc. (J.S.A. w.e.f. 5.12.77)

DEPARTMENT OF COAL PALAEOBOTANY

Dr G.K.B. Navale, M.Sc., Ph.D., F.G.S., B.G.M.S.
Dr R. S. Tiwari, M.Sc., Ph.D.
Dr Suresh C. Srivastava, M.Sc., Ph.D.
Dr Pramod Kumar, M.Sc., Ph.D.
Shri S. K. Kulshreshtha, M.Sc.
Shri B. K. Misra, M.Sc.
Miss Archana Dwivedi, M.Sc. (S.S.A. w.e.f. 13.10.77)
Miss Vijaya Rana, M.Sc.
Shri Rakesh Saxena, M.Sc.

DEPARTMENT OF QUATERNARY PALYNOLOGY

Dr Vishnu-Mittre, M.Sc., Ph.D. (Lucknow), Ph.D. (Cantab).
Dr H. P. Gupta, M.Sc., Ph.D.
Dr Anand Prakash, M.Sc., Ph.D.

Dr (Mrs) Chhaya Sharma, M.Sc., Ph.D.
Miss R. Savithri, M.Sc. (S.S.A. w.e.f. 13.10.77)
Shri A. K. Saxena, M.Sc.
Shri Kamla Prasad, M.Sc.
Shri Amalava Bhattacharyya, M.Sc. (Research Scholar)

DEPARTMENT OF OIL PALYNOLOGY

Dr S.C.D. Sah, M.Sc., Ph.D. (on foreign service, permanently absorbed in Wadia Institute of Himalayan Geology, Dehra Dun as Director w.e.f. 2.2.78).
Dr Haripal Singh, M.Sc., Ph.D.
Dr K. P. Jain, M.Sc., Ph.D.
Dr R. K. Kar, M.Sc., Ph.D.
Dr R. Y. Singh, M.Sc., Ph.D.
Dr R. K. Saxena, M.Sc., Ph.D. (S.S.A. w.e.f. 13.10.77)
Shri A. K. Khanna, M.Sc. (upto 10.10.77)
Shri S.K.M. Tripathi, M.Sc.
Shri Rahul Garg, M.Sc.
Shri M. R. Rao, M.Sc. (J.S.A. w.e.f. 29.10.77)

GEOLOGY SECTION

Shri N. C. Mehrotra, M.Sc. (upto 17.10.77)

C-14 LABORATORY

Dr G. Rajagopalan, M.Sc., Ph.D. (Bombay)
Shri Deb Kumar Biswas, M.Sc. (J.S.A. w.e.f. 7.3.78)

PUBLICATION

Shri Jaswant Singh, M.Sc. (Assistant Editor)

LIBRARY

Shri J. N. Nigam, B.A., B. Lib. Sc. (Librarian)
Shri S. N. Joshi, B.Sc., B. Lib. Sc. (Library Assistant upto 31.8.77)

MUSEUM

Shri N. C. Saxena, B.A. (Museum Assistant)
Shri J. C. Srivastava, M.Sc. (Offg. Junior Museum Assistant)

HERBARIUM

Dr H. A. Khan, M.Sc., Ph.D. (Curator)
Shri G. P. 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. (S.T.A. w.e.f. 13.10.77)
Miss Asha Bharadwaj, B.Sc. (J.T.A.)
Miss Madhabi Chowdhury, B.Sc. (J.T.A.)
Miss Indra Kumari, B.Sc. (J.T.A.)
Shri D. C. Joshi, B.Sc. (J.T.A.)
Miss 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 K. Rehman, B.Sc. (J.T.A.)
Shri Vijay Singh Panwar (Glass Blower)
Shri P. S. Salujha (Mechanic)

PHOTOGRAPHY AND DRAWING

Shri S. S. Rana (Artist) (on lien w.e.f. 5.4.77 for two years)
Shri Pramod Kumar Bajpai (Artist w.e.f. 28.1.78)
Shri P. C. Roy (Photographer)

STORES

Shri Harjeet Singh, B.A.

ACCOUNTS

Shri Ghanshyam Singh, B.Com. (Accounts Officer)
Shri S. B. Verma, M.A., B.Com., D.P.A. (Accountant)
Shri T. N. Shukla, B.A. (U.D.C.)
Shri B. K. Jain, B.A. (U.D.C.)
Shri N. N. Joshi (L.D.C.)
Shri R. K. Takru, B.A. (L.D.C.)
Shri Baby Yohannan (L.D.C. w.e.f. 22.6.77)

ADMINISTRATION

Shri Gurcharan Singh, M.A., LL.B. (Registrar)
Shri V. P. Gulati (Deputy Registrar)
Shri S. D. Mehtani (Office Assistant)
Shri S. K. Suri (Stenographer)
Shri S. P. Chadha, B.A. (P.A. to Director)
Mrs P. K. Srivastava (Receptionist)
Shri H. S. Srivastava, B.Com. (U.D.C.)
Shri Bhagwan Singh (U.D.C.)
Shri I. J. S. Bedi (Steno-typist)
Shri Ramesh Chandra (L.D.C.)
Shri R. K. Kapoor (L.D.C. w.e.f. 22.6.77)
Mrs V. Nirmala (L.D.C. w.e.f. 8.8.77)

Statement of Accounts for the Year 1977-78

BALANCE SHEET AS

LIABILITIES		AMOUNT Rs.	AMOUNT Rs.
Capital Funds			
As per 31st March, 1977		39,36,471.08	
Government of India Grant on Capital Account during the year		4,50,000.00	
Recurring Grant used for capital formation :			
Books & Journals	19,040.40		
Petty construction	6,959.17	25,999.57	
		44,12,470.65	
Less Refund out of Capital Grants		19,394.39	43,93,076.26
Add Excess of Revenue Grants over Revenue Expenditure			4,91,846.08
Add Funds provided by other organisations for Capital formation :			
M. G. T. Scheme	(C.S.I.R.)	8,100.79	
Coal Scheme	(C.S.I.R.)	7,784.66	
Palynology Scheme	(C.S.I.R.)	5,207.87	
Rajasthan Scheme (sponsored by University of Wisconsin)		58,913.25	80,006.57

OF PALAEOBOTANY, LUCKNOW

ON 31st MARCH, 1978

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Land Donated by U. P. Govt.	—	32,292.00
Works and Buildings		
As per 31st March, 1977	14,32,811.24	
During the year	11,766.46	14,44,577.70
Apparatus and Equipments		
(A) *Research apparatus & equipments :*		
As per 31st March, 1977	7,77,176.97	
During the year	28,134.55	8,05,311.52
(B) *Workshop equipments*	—	62,213.95
(C) *Office & Miscellaneous equipments :*		
As per 31st March, 1977	69,429.27	
During the year	24,587.50	94,016.77
(D) *Plant & Machinery*		
As per 31st March, 1977	87,168.55	
During the year	19,906.99	1,07,075.54
(E) *Establishment of C-14 Lab.*		
As per 31st March, 1977	6,32,976.46	
During the year	38,177.69	6,71,154.15
Apparatus and Equipment (Donated)		
M. G. T. Scheme	7,155.79	
Burmah Oil Company	700.00	
Founders Donation	2,500.00	

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.
Cost of Land Donated by U. P. Govt.	—	32,292.00
U. N. E. S. C. O. Aid Fund	—	19,629.75
Value of Gift in Kind-Humboldt Foundation W. Germany	—	75,000.00
General Provident Fund	—	7,27,488.84
Donation Accounts :		
C. D. P. Memorial Fund	—	1,626.88
C. L. K. Memorial Fund	2,218.50	
P. C. B. Memorial Fund	1,976.75	
A. C. Seward Memorial Fund	6,034.50	
P. K. Srivastava Memorial Fund	2,660.00	
Other Donations	7,383.40	
Dorothy Walton	352.70	20,625.85
Founders Donation Account	—	1,52,500.00
Burmah Oil Company	—	1,900.00
Deposit Account	—	29,628.20
Value of priced publications		
As per contra	—	3,87,453.75
Loans and Advances		
As per contra	—	46,724.00
	Total C/o ...	64,59,798.18

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Coal Scheme	6,645.29	
Palynology Scheme	5,207.87	
Rajasthan Scheme	21,138.90	43,347.85
U. N. E. S. C. O. Aid Equipment	—	19,629.75
Humboldt Foundation West Germany		
(Gift of Microscope)	—	75,091.50
Vehicles		
As per 31st March, 1977	56,433.65	
During the year	68,502.86	1,24,936.51
Furniture & Fixtures		
As per 31st March, 1977	4,18,154.35	
During the year	57,445.96	4,75,600.31
Furniture & Fixture (Donated)		
Burmah Oil Company	1,200.00	
M. G. T. Scheme	945.00	
Coal Scheme	1,139.37	
Rajasthan Scheme	979.70	4,264.07
Books and Journals		
As per 31st March, 1977	1,23,444.44	
During the year	47,924.92	1,71,369.36
Founders Library Donated	—	50,000.00
Maps and Toposheets		
As per 31st March, 1977	—	9,206.96

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.
	Total B/F	64,59,798.18
	Total C/o	64,59,798.18

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Founder's Fossil Collections (Donated)	—	50,000.00
Donation Account		
Investments	—	16,000.00
General Provident Fund		
Investments	3,29,000.00	
Advance out of G. P. F.	99,777.00	
Insurance policies subscribed out of G. P. F. to the extent of	37,032.00	4,65,809.00
Priced Publications in Stock		
"The Palaeobotanist" volumes (1-24)	1,74,675.75	
Symposium	61,155.00	
Autumn School Proceedings	30,600.00	
Monograph	42,800.00	
Seward Memorial Lecture	22,910.00	
Birbal Sahni Memorial Lecture	6,578.00	
Silver Jubilee Lecture	3,147.00	
Catalogue of Indian Fossil Plants	31,725.00	
Picture Post Cards	13,863.00	3,87,453.75
Loans and Advances		
Festival advance	3,400.00	
Conveyance advance	42,384.00	
Natural Calamities advance	940.00	46,724.00

LIABILITIES	AMOUNT Rs.	AMOUNT Rs.
	Total B/F	64,59,798.18
	Grand Total C/o	64,59,798.18

Sd/- Ghanshyam Singh
Accounts Officer
Birbal Sahni Institute of Palaeobotany,
Lucknow

ASSETS	AMOUNT Rs.	AMOUNT Rs.
Sundry Debtors		
For unsettled advances (C. R. Account)	55,161.31	
For unsettled advances (C. N. R. Account) as on 31.3.1978	3,73,965.37	4,29,126.68
U. N. E. S. C. O. Book Coupons	—	793.02
Cash Balance :		
At Bank		
Current Account at S. B. I., Lucknow	6,11,993.00	
Savings Bank Account at S. B. I., Lucknow	2,61,679.84	
In Hand		
C. R. Account	130.95	8,73,803.79
	Grand Total	64,59,798.18

Sd/- Gurcharan Singh
Registrar
Birbal Sahni Institute of
Palaeobotany, Lucknow

Sd/- K. R. Surange
Director
Birbal Sahni Institute of
Palaeobotany, Lucknow

INCOME AND EXPENDITURE ACCOUNT

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Academic Expenses			
To Pay & Allowance of Academic Staff	2,74,892.83	5,11,654.92	7,86,547.75
To Field Excursions	26,410.88	7,563.96	33,974.84
To Remuneration of Birbal Sahni Professor	18,000.00	—	18,000.00
To Honorarium to Lecturers			
(i) Birbal Sahni Memorial Lecture	—	350.00	350.00
(ii) Silver Jubilee Commemoration Lecture	—	350.00	350.00
To training of Academic staff	—	—	—
To International Programme			
Deputations abroad	—	—	—
Expenses of Services Ancillary to Research			
To pay & Allowance of Auxiliary Tech. Staff	29,537.88	2,23,490.27	2,53,028.15
To chemical & Glasswares Photogoods & Small App. etc.	32,892.59	70,487.88	1,03,380.47
To Library Requirements	—	22,984.75	22,984.75
To Herbarium Requirements	—	1,752.23	1,752.23

OF PALAEOBOTANY, LUCKNOW

FOR THE YEAR ENDING 31st MARCH, 1978

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Balance of Last Year's Grant of Revenue A/c Allowed for Expenditure during Current Year	46,248.08	85,238.55	1,31,486.63
By Grants from Govt. of India on Revenue Account	5,50,000.00	16,00,669.78	21,50,669.78
By Grants from U. P. Government on Revenue Account	—	5,000.00	5,000.00
By Grants from other Organisations			
University Grants Commission's Fellowship	—	8,213.07	8,213.07
By Sale Proceeds of Publications			
(i) The Palaeobotanist	—	45,120.49	45,120.49
(ii) The Monographs	—	398.00	398.00
(iii) Symposium & Spl. publications	—	3,932.50	3,932.50
(iv) Seward Memorial Lecture	—	1,383.80	1,383.80

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Museum Requirements	500.10	2,794.89	3,294.99
To Maintenance of Equip., Apparatus & Workshop Machinery	9,605.20	—	9,605.20
To Publication expenses			
"The Palaeobotanist"	—	23,864.32	23,864.32
Catalogue	—	—	—
Spl. Publication-Monograph on *Glossopteris* species	—	18,076.90	18,076.90
Birbal Sahni Memorial Lecture	—	1,702.74	1,702.74
Silver Jubilee Commemoration Lecture	—	—	—
Annual Report	—	2,888.11	2,888.11
Seward Memorial Lecture	—	580·30	580.30
To Travelling & other allowances			
For Governing Body, Scientific programming and Evaluation Committee and Selection Committee Meeting	1,615.25	4,088.57	5,703.82
For attending scientific meetings and conferences in India and for other purposes	290.00	13,783.46	14,073.46
For reimbursement of medical expenses	2,710.29	16,864.27	19,574.56
For overtime allowance	79.20	1,032.61	1,141.81

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
(v) Birbal Sahni Mem. Lecture	—	2,860.10	2,860.10
(vi) Silver Jubilee Commemoration Lecture	—	104.00	104.00
(vii) Picture Post Cards	—	497.55	497.55
(viii) A Catalogue of Indian Fossil Plants	—	3,514.50	3,514.50
By Miscellaneous Receipts & Recoveries			
(i) Vehicle charges	—	647.46	647.46
(ii) By Telephone charges	—	607.80	607.80
(iii) By Visiting Scientist Room charges	—	305.00	305.00
(iv) By application fees	—	1,279.00	1,279.00
(v) Miscellaneous Receipt & Recoveries	7,026.87	748.20	7,775.07
(vi) Recoveries of Conv. Advance	—	11,385.00	11,385.00
(vii) Recovery of Fest. Advance	—	4,800.00	4,800.00
(viii) Interest on advance (Conv. Adv.)	—	294.94	294.94
(ix) Recoveries of natural calamities advance	—	60.00	60.00

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
For Leave Travel Concession	—	5,836.90	5,836.90
For reimbursement of tuition fees	153.00	348.75	501.75
To Child Education allowance	—	713.50	713.50
To Pensionary Expenses			
To Superanuation Allowance and Pension	—	13,505.80	13,505.80
To General Expenses			
To Pay & Allowances of Adm. staff	14,811.44	3,00,132.77	3,14,944.21
To Telephone & Trunk Call charges	—	13,401.11	13,401.11
To Postage	—	10,178.79	10,178.79
To Advertisement charges	15,198.82	5,778.77	20,977.59
To Hot & Cold Weather charges	550.00	1,635.18	2,185.18
To Petrol & Mobil Oil	1,992.28	1,991.09	3,983.37
To electricity charges	13,381.56	27,004.29	40,385.85
To Municipal Taxes	—	11,500.00	11,500.00
To Insurance of Vehicle & Library	—	2,852.80	2,852.80
To Uniform of Class IV Employees	200.00	3,588.40	3,788.40
To Printing & Stationery	10,080.36	12,930.11	23,010.47

	INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
(x)	C. D. S. Addl. D. A. from R. P. F. Commissioner, Kanpur	9,585.58	43,091.96	52,677.54
(xi)	Pension contribution of Dr S.C.D. Sah	—	2,693.00	2,693.00
(xii)	Leave Salary contribution of Dr S.C.D. Sah	—	1,568.39	1,568.39
	Total C/o	6,12,860.53	18,24,413.09	24,37,273.62

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To customs duty and port trust charges	—	307.00	307.00
To Rly. Ft. & Carriage	—	1,662.26	1,662.26
To entertainment Allow. to Director	—	1,122.84	1,122.84
To Miscellaneous & Unforeseen expenses	8,842.57	11,637.11	20,479.68
To Maintenance expenses			
To Building	—	4,317.11	43,17.11
To Garden	—	4,421.60	4,421.60
To Vehicle	3,976.97	6,139.43	10,116.40
To Repairs & Renewals	—	2,663.29	2,663.29
To petty construction	—	2,294.64	2,294.64
To other expenses			
To legal advice	—	1,045.00	1,045.00
To Medical advice	—	72.00	72.00
To Festival advance	—	5,000.00	5,000.00
To Conveyance advance	—	27,625.00	27,625.00
To Natural Calamities advance	—	1,000.00	1,000.00
To U. G. C. expenses			
To Fellowship	—	5,493.17	5,493.17
To Government of India Scholarship expenses	—	16,489.89	16,489.89

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	6,12,860.53	18,24,413.09	24,37,273.62
Total C/o	6,12,860.53	18,24,413.09	24,37,273.62

EXPENDITURE	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Expenditure out of Receipts			
C. D. S. Addl. D. A. from R. P. F. Commissioner, Kanpur	9,585.58	43,091.96	52,677.54
Excess of Income over Expenditure	1,37,533.73	3,54,292.35	4,91,846.08
Grand Total	6,12,860.53	18,24,413.09	24,37,273.62

Sd/- Ghanshyam Singh
Accounts Officer
Birbal Sahni Institute of Palaeobotany,
Lucknow

INCOME	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	6,12,860.53	18,24,413.09	24,37,273.62
Grand Total	6,12,860.53	18,24,413.09	24,37,273.62

Sd/- Gurcharan Singh
Registrar
Birbal Sahni Institute of
Palaeobotany, Lucknow

Sd/- K. R. Surange
Director
Birbal Sahni Institute of
Palaeobotany, Lucknow

RECEIPT AND PAYMENT ACCOUNT FOR

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
To Opening Balance			
Bank Account (C. R. A/C)	3,83,715.85	84,349.51	4,68,065.36
Cash Account	11.25	127.30	138.55
Oil India Account			
Bank Account	—	745.58	745.58
Cash Account	—	16.16	16.16
Donation Account			
Bank Account	—	6,482.73	6,482.73
Refund of Excursion advances	3,744.97	—	3,744.97
To Govt. of India Grants (Cap. A/C)	4,50,000.00	—	4,50,000.00
To Govt. of India Grants (Rev. A/C)	5,50,000.00	16,00,669.78	21,50,669.78
To Govt. of U. P. Recurring Grant	—	5,000.00	5,000.00
To Grants from other Organisations			
To University Grants Commission	—	8,213.07	8,213.07
Sale Proceeds of Publications			
The Palaeobotanist	—	45,120.49	45,120.49

OF PALAEOBOTANY, LUCKNOW

THE PERIOD 1.4.1977 TO 31.3.1978

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Capital Account			
By Opening Balance	—	—	—
By Works & Building	4,807.29	—	4,807.29
By App. & Equipment			
By Res. App. & Equipment	3,50,915.69	—	3,50,915.69
By Equip. for services Anciliary to Research :			
Photography section	6,918.85	—	6,918.85
Library	29,985.22	—	29,985.22
Museum	5,826.80	—	5,826.80
Office & Misc. Equipment	68,502.86	—	68,502.86
C-14 Laboratory	95,062.45	—	95,062.45
By Furniture & Fixtures	48,619.16	—	48,619.16
By Refund of Grants to Govt.			
Capital Grants	19,394.39	—	19,394.39
Pay and Allowances			
Pay (Academic)	1,94,860.52	3,71,222.23	5,66,082.75
Pay (Auxiliary Technical)	18,676.07	1,40,126.54	1,58,802.61
Pay (Administrative)	8,588.29	1,89,087.59	1,97,675.88
Dearness Allowance	62,358.50	2,26,599.00	2,88,957.50

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Monograph	—	398.00	398.00
Symposium	—	3,932.50	3,932.50
Catalogue	—	3,514.50	3,514.50
Seward Memorial Lecture	—	1,383.80	1,383.80
Birbal Sahni Memorial Lecture	—	2,860.10	2,860.10
Picture Post Cards	—	497.55	497.55
Silver Jubilee Commemoration Lect.	—	104.00	104.00
To Administrative Receipts			
Income-Tax	11,862.00	25,741.00	37,603.00
Insurance premium (S. S. Scheme)	14,130.68	30,410.36	44,541.04
C.T.D. (Post Office)	1,440.00	6,360.00	7,800.00
Vehicle charges	—	647.46	647.46
Telephone charges	—	607.80	607.80
V. S. Room charges	—	305.00	305.00
Recovery of advance & Interest under G.P.F.	10,290.00	50,356.00	60,646.00
G.P.F. Subscription	23,014.00	92,132.00	1,15,146.00
C. D. S. Remittance to R.P.F. Commissioner, Kanpur	2,597.00	10,849.00	13,446.00
Miscellaneous receipts & recoveries	3,281.90	748.20	4,030.10

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
House rent allowance	25,919.36	80,164.74	1,06,084.10
City Compensatory Allowance	8,839.41	28,077.86	36,917.27
Children Educational Allowance	—	713.50	713.50
Overtime Allowance	79.20	1,062.61	1,141.81
Reimbursement of Medical Exp.	2,710.29	17,014.27	19,724.56
Reimbursement of Tuition fees	153.00	348.75	501.75
Leave travel concession	—	8,679.90	8,679.90
By fellowship to U.G.C. Fellow	—	5,493.17	5,493.17
By remuneration to Birbal Sahni Professor	18,000.00	—	18,000.00
By Travelling Allowance			
For Governing Body & Selection Committee meetings	1,615.25	4,088.57	5,703.82
For attending meetings & conferences in India and for other purposes	1,440.00	15,343.46	16,783.46
By Maintenance of Property			
For Building	—	8,362.11	8,362.11
For Garden	—	4,421.60	4,421.60
For Equipment and Apparatus	9,858.20	—	9,858.20

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
C. D. S. Receipts from R.P.F. Commissioner, Kanpur	9,585.58	43,091.96	52,677.54
Application fees	—	1,279.00	1,279.00
Pension contribution	—	2,693.00	2,693.00
Leave salary contribution of Dr S. C. D. Sah	—	1,568.39	1,568.39
For Loans & Advances			
Recovery of Festival Advances	—	4,800.00	4,800.00
Recovery of conveyance Advances	—	11,385.00	11,385.00
Recovery of Natural Calamity Advance	—	60.00	60.00
Interest on conveyance Advances	—	294.94	294.94
To Deposits			
Security Deposits	882.00	—	882.00
To Misc. Receipts on Capital Account	10,858.14	—	10,858.14
Donation and Endowments			
Proceeds of matured securities	—	—	—
Interest	—	120.00	120.00
Total	14,75,413.37	20,46,864.18	35,22,277.55

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
For vehicles	3,976.97	6,139.43	10,116.40
For repairs & renewals	—	2,663.29	2,663.29
For petty construction	—	5,494.64	5,494.64
By Contingencies			
By telephone and trunk call charges	—	13,401.11	13,401.11
For Postage	—	10,278.79	10,278·79
For advertisement	15,198.82	5,778.77	20,977.59
For Hot & Cold weather charges	550.00	1,635.18	2,185.18
For Petrol & Mobil Oil	1,992.28	2,791.09	4,783.37
For Electricity charges	13,381.56	27,004.29	40,385.85
For Municipal taxes	—	11,500.00	11,500.00
For Insurance of Vehicle and Library	—	2,852.80	2,852.80
For Liveries to Cl. IV Staff	200.00	3,488.40	3,788.40
For Printing & Stationery	10,080.36	14,580.11	24,660.47
For customs duty & Port trust charges	—	307.00	307.00
For Rly. Ft. & Carriage	—	1,662.26	1,662.26
For entertainment Allow. to Director	—	1,122.84	1,122.34
For Misc. & Unforeseen	8,842.57	13,517.36	22,359.93
For Chemical & Glass-wares	32,892.59	77,353.12	1,10,245.71
For Library Requirements	—	29,833.02	29,833.02

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	14,75,413.37	20,46,864.18	35,22,277.55
Grand Total	14,75,413.37	20,46,864.18	35,22,277.55

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
For Herbarium requirements	—	2,172.23	2,172.23
For Museum requirements	500.10	2,801.44	3,301.54
For Legal Advice	—	1,345.00	1,345.00
For C.D.S. from R.P.F. Commissioner, Kanpur	9,585.58	43,091.96	52,677.54
For Medical Advice	—	72.00	72.00
For Publications			
The Palaeobotanist	—	23,864.32	23,864.32
For Special Publication : "Monograph on *Glossopteris* species"	—	18,076.90	18,076.90
For Seward Memorial Lecture	—	580.30	580.30
For Annual Report	—	2,888.11	2,888.11
For Birbal Sahni Mem. Lecture	—	1,702.74	1,702.74
For Academic Expenses			
For Field excursions	49,500.88	7,563.96	57,064.84
Hon. for Birbal Sahni Mem. Lecture	—	350.00	350.00
Hon. for Sir A. C. Seward Mem. Lecture out of Donation Account	—	350.00	350.00
Hon. for Silver Jubilee Comm. Lecture	—	350.00	350.00

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	14,75,413.37	20,46,864.18	35,22,277.55
Grand Total	14,75,413.37	20,46,864.18	35,22,277.55

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
For training of Academic staff at G.S.I. Camp	—	—	—
By International Programmes			
Air passage for members of staff proceeding on foreign fellowships or invited to attend Scientific meetings and conferences abroad	—	—	—
By G.P.F Account			
G.P.F. Subs. transferred to G.P.F. A/c	23,014.00	92,132.00	1,15,146.00
Recovery of Adv. & Interest thereon transferred to G.P.F. A/c	10,290.00	50,356.00	60,646.00
By Miscellaneous			
Income-Tax remitted	11,862.00	25,741.00	37.603.00
Insurance premium remitted	14,130.68	30,410.36	44,541.04
C.D.S. Addl. D.A. remitted	2,597.00	10,849.00	13,446.00
C.T.D. Amount remitted	1,440.00	6,360.00	7,800.00
By Govt. of India Scholarships	—	16,489.89	16,489.89
By Loans & Advances			
Natural calamity advance	—	1,000.00	1,000.00

RECEIPTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Total B/F	14,75,413.37	20,46,864.18	35,22,277.55
Grand Total	14,75,413.37	20,46,864.18	35,22,277.55

BANK

Plan	1,13,060.73	1,69,186.45	2,82,247.18*
Non-Plan			
Central Recurring	3,19,761.45	—	—
Oil India	761.74	—	—
U. G. C.	2,969.90	—	—
Donation & Endowments	6,252.73	—	—
	3,29,745.82	—	—
Cash in hand	130.95	—	—
	3,29,876.77**		

Sd/- Ghanshyam Singh
Accounts Officer
Birbal Sahni Institute of Palaeobotany,
Lucknow

PAYMENTS	PLAN Rs.	NON-PLAN Rs.	TOTAL Rs.
Festival advance	—	5,000.00	5,000.00
Conveyance advance	—	27,625.00	27,625.00
By Oil India Expenses	—	—	—
By Amount Transferred to C. R. Deposit Account	—	—	—
By Pension & Superanuation	—	13,505.80	13,505.80
By Closing Balance	*2,82,247.18	3,29,876.77**	6,12,123.95
Grand Total	14,75,413.37	20,46,864.18	35,22,277.55

CLOSING BALANCE

CASH

Recurring	Non-Recurring
Nil	—
130.95	—
—	—
—	—
—	—
130.95	Nil

Sd/- Gurcharan Singh
Registrar
Birbal Sahni Institute of
Palaeobotany, Lucknow

Sd/- K. R. Surange
Director
Birbal Sahni Institute of
Palaeobotany, Lucknow