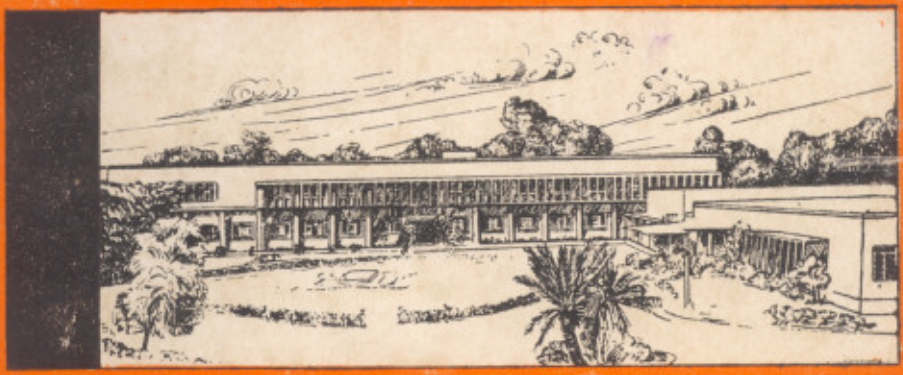
Annual Report

1976-77



BIRBAL SAHNI INSTITUTE OF PALAEOBOTANY

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CONTENTS

I. INTRODUCTION

The Institute is devoted to research in all aspects of Palaeobotany, both fundamental and applied. In keeping with this broad scope it has taken up for the Vth Five Year Plan a number of projects which mainly fall under the following areas of research :

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 of 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 important contributions made during the year under review are :

1. The study of the microbiota recovered from the Pre-Gondwana, Vindhyan and Jutogh formations has revealed the occurrence of some very interesting forms of acritarchs.

2. Investigations have been completed on the cuticular structure of Glossopterid fructifications from the Raniganj Coalfield. Two new types of female fertile genera, *Venustostrobus* and *Jambadostrobus* have been described. The studies in general prove that *Glossopteris* is not a single genus but comprises many different kinds of leaves of generic level.

3. Biometric analysis of the *Plicatipollenites - Potonieisporites* complex has been completed in five different basins covering the Talchir-Karharbari Lower Barakar time span. This study, based on about 1500 miospores investigated morphometrically, has provided the objective criteria for separating *Plicatipollenites* population from the *Potoniesporites* population.

4. A new ginkgoalean remain, *Ginkgoites-goiraensis* n. sp. has been reported from the Triassic sediments of South Rewa Gondwana Basin.

5. A leaf impression from the Deccan Intertrappean beds of Mohgaonkalan showing close resemblance with the leaf of *Musa* has been studied in detail.

6. Ninetysix rock samples from Kharsang Well-3 and twelve flush samples from Manabum Well-1 were analysed palynologically for the Oil India Ltd. A consolidated report covering palynological work

done for Oil India Ltd. from 1970-1976 was prepared.

7. On the basis of dominance of palynotaxa, *Triorites triangulus* Cenozone has been proposed for the Lower Eocene and *Proxapertites microreticulatus* Cenozone has been established for the Middle Eocene in Kutch.

8. Examination of the Karewa beds of Kashmir has revealed the occurrence of the leaf impressions of the fern *Pteridium* and the seedlings of *Pinus*

9. Age measurement of samples has been fully taken up by the Radio-carbon Dating Laboratory. During the year eighty five samples, including background and standard samples, were prepared and measurements carried out.

Interdisciplinary studies were carried out in collaboration with Oil and Natural Gas Commission, Dehra Dun ; Indian Statistical Institute, Calcutta ; University of Lyon, France ; Geological Survey of India ; Oil India Ltd., Duliajan ; Directorate of Mineral Resources, Meghalaya ; Geology Department, Lucknow University ; Coal India Ltd. ; Directorate of Geology and Mining, Nagaland ; Neyveli Lignite Corporation ; Directorate of Geology and Mining, Gujarat ; Archaeological Survey of India ; Department of Ancient Indian History and Archaeology, Kurukshetra ; and Forest Research Institute, Dehra Dun.

As before, training in palaeobotanical methodology and technical assistance on palaeobotanical and related problems was provided to several institutions and individuals from India and abroad.

The Institute published *"A Catalogue of Indian Fossil Plants"*. This publication has brought together all the known records of the very large number of fossil plants reported from India until 1970 and is a very useful source of dependable ready reference for any palaeobotanist interested in taxonomical information.

The most outstanding feature of the year was the IV International Palynological Conference hosted by the Institute from 29th December, 1976 to 5th January, 1977. It was attended by about 340 delegates of whom 137 were foreign and rest Indian. The conference was inaugurated by Professor T. S. Sadasivan, Chairman Governing Body of the Institute. Its General President was Dr D. C. Bharadwaj who gave his Presidential Address on 'The significance of evolution in Palynology.' The scientific deliberations of the conference were grouped under six divisions covering all aspects of palynology. In all, 292 research papers were presented during the 29 symposia and non-symposia sessions. Besides, 5 plenary and 5 special lectures were delivered by distinguished scientists of India and abroad. The Birbal Sahni Memorial Lecture and Seward Memorial Lecture were also held during this conference. By bringing a large number of palynologists in personal contact with each other this gathering established better understanding amongst the participants and increased the possibilities of scientific collaboration between this Institute and other centres of the world engaged in palynological research.

II. RESEARCH

1. PRE-GONDWANA

1 1. Vindhyan Formation

A microbiota has been recovered from the Limestones collected near Ghugus, Chandrapura District. It contains the acritarch remains belonging to Sphaeromorphitae.

1.2. Jutogh Formation

The study of the microbiota recovered from the rocks of Jutogh Formation collected around Simla has been completed. The microbiota comprises remains of acritarchs, *Bavlinella*, *Ellipsaletes*, *Anguloplanina* and *Protosphaeridium*. On the basis of this study Vendian age has been assigned to these beds.

1.3. Pre-Gondwana from Abroad

1.3.1. *Oncolites from Zaire*

Studies on the Oncolites from the Precambrian (Lower Zaire, Shaba and Bushimay Formation) have been completed. The Oncolites are referred to *Osagia*, *Ambigolamellatus*, *Volvatella* and *Asterosphaeroides*. Further, a catagraph genus *Vesicularites* has been identified.

2. LOWER GONDWANA

2.1. Morphological Studies in the Glossopteris Flora

2.1.1. *Pteridophytes*

A paper on the morphological study on *Stellotheca robusta* Surange & Prakash has been sent to the Press. The study reveals that the leaves are free at the nodes, without forming any cup-like sheath. In addition, the possible habit and phylogeny have also been discussed.

2.1.2. *Gymnosperms*

A. Investigations on the cuticular structure of Glossopterid fructifications from the Raniganj Coalfield, West Bengal have been completed. Two new types of female fertile genera *Venustostrobus* and *Jambadostrobus* have been described. One paper comprising these two genera and concluding remarks on the previous genera has been finalized and sent to Press. All the four female fertile organs attached to four different kinds of *Glossopteris* leaves are now known from the Raniganj Coalfield. This again proves that *Glossopteris* is not a single genus but comprises many different kinds of leaves of generic level.

B. Detached scale leaves from the Raniganj Coalfield with their cuticular structure and those from Handappa, without cuticles, have been studied and a paper has been sent to Press. Now it is possible to recognize the fertile genera on the basis of detached scales in the collection.

C. A study on the male fructifications of *Eretmonia* with its sporangia recovered from the Raniganj Coalfield has been completed and a paper has been sent to Press.

D. Type specimens of *Glossopteris* from Feistmantel's collection at Geological Survey of India, Calcutta have been undertaken for study. All the *Glossopteris* specimens from different horizons of Lower Gondwana have been studied.

They are drawn on 1 sq cm grid to see how this system can be utilized in identifying different species of *Glossopteris*. A monograph is being written on the same.

E. Cuticular studies of the *Glossopteris* leaves from the Raniganj Stage have been undertaken and the cuticular preparations of two types of *Glossopteris* leaves have been completed. Their identification and correlation with the morphological characters is under progress.

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

Megafossils, including a number of fossil woods, have been collected from the Kamthi beds near Kanhargaon in the Wardha-Godavari Valley. The flora is under study.

2.1.4. *Pachwara Coalfield*

The megafossils and microfossils recovered from the beds exposed in the Bansloi River near Tattitola have been studied. On the basis of this study the age of the beds appears to be younger than the Barakar.

2.1.5. *Hutar Coalfield, Bihar*

A detailed morphological study of miospores present in Talchir and Karharbari formations has been completed on systematically collected samples from measured sections. Study of Barakar mioflora is under progress.

The Karharbari-Barakar boundary has been marked on lithological and palynological grounds. Some new faults have also been marked on map.

2.2. Sporae Dispersae and Palynostratigraphy

2.2.1. *Morphology of Lower Gondwana Spores*

Biometric analyses of the *Plicatipollenites-Potonieisporites* complex have been completed in five different basins covering the Talchir – Karharbari – Lower Barakar time span. In all, about 1,500 miospores have been morphometrically investigated from South Rewa, Jayanti, Giridih, South Karanpura and Hutar coalfields. Suitable morphographic parameters were analysed in space and time to study the pattern and trend of variation. The results have provided the objective criteria for separating *Plicatipollenites* population from *Potonieisporites* population which shows a time-proportionate evolutionary relationship. A paper on the work is under progress.

2.2.2. *Palynostratigraphy of South Karanpura Coalfield*

A. Palynological investigations through the coal deposits in South Karanpura Coalfield have been completed and submitted in the form of a Ph.D. thesis. In this assemblage 51 genera and 124 species have been identified, out of which 1 genus and 6 species are new.

B. Three palynological zones—1. *Scheuringipollenites* + *Brevitriletes*, 2. *Faunipollenites*, and 3. *Scheuringipollenites* + *Cyclogranisporites* have been established. The first and the second zone belong to Lower Barakar while the third zone is of early Upper Barakar. The recurrence of *Scheuringipollenites* zone with a changed composition is very significant. The manuscript is being finalized for publication.

2.2.3. *Permo-Triassic Palynology*

A study of Permian and Triassic sequence from Raniganj, East Bokaro and North Karanpura coalfields has been completed. The study reveals that the striate-disaccate genera, characteristic of the Upper Raniganj Stage, decline in the Lower Panchet beds and this change is associated with the

incoming of new trilete elements which is a characteristic of the Lower Triassic. The results are being finalized for publication.

2.2.4. *Mioflora in Talcher Coalfield*

Surface and subsurface sediments from this coalfield were studied and two palynological zones were distinguished as :

Older — trilete and nonstriate-disaccate rich.
Younger — striate-disaccate rich.

2.2.5. *Miofloral Studies in Arunachal Pradesh*

An attempt to extract miospores from 38 samples recovered from Kameng District, representing Lower Gondwana sediments, was unsuccessful.

2.2.6. *Morphotaxonomic Study of Trilete Genera*

A detailed study on morphology of some trilete genera has been done. The generic and specific delimitations in this group have been made. The distribution of these species through Lower Gondwana formations has been determined. Further it has been concluded that these species are very useful for dating. The interpretation part of the work is in progress.

2.2.7. *Ultrastructural Study of Miospores*

Preparations for ultra thin sections of the specimens of *Callumispora* were made and sections obtained. The same is to be continued taking the representative specimens from different horizons.

2.3. Petrology and Palynology of Palaeozoic Coals

2.3.1. *Study on Distribution of Macerals and Miospores in Lower Gondwana Coals of India*

Detailed palynological studies coupled with petrographic analysis of a large number of coal seams in Lower Gondwana sequence show characteristic miospore assemblages. Each of these assemblages is associated with distinctive petrographic type. The data has provided clue on some factors that determine the mode of peat formation. The factors that were of significance in controlling the nature of vegetation and peat types were climate (humidity and temperature) and water level in relation to peat surface and biogeographical environment of the basins.

2.3.2. *Evaluation of Genetic Coal Types by Palynological Methods*

Because spores and pollen grains retain their morphological characteristics during all stages of coal formation, they bear specific relationship to phyto-organic settings. A review of the existing data on palynological analysis in determination of swamp types and their bearing on genesis of coals has been made.

2.3.3. *Study on Source Material of Gondwana Coals & Ultimate Coal Constituents*

Detailed microscopic studies of various types of botanical entities of Lower Gondwana coals and their petrological constituents are being made to ascertain the mode and transformation of swamp material into ultimate coal components. Two groups have been made on the basis of coal composition, namely (1) anthraxylous (macrofragment type), and (2) attrital (microfragment type) for determination of unit and mixed coal types.

2.3.4. *Biopetrological Studies of Bokaro Coalfield*

Sampling and sieving of 80 samples from East Bokaro area have been completed. Forty coal pellets from different coal seams were prepared. Eight coal blocks were also

prepared for the megascopic studies. Scanning of some pellets and blocks to familiarize with the coal constituents was done.

2 4. Mioflora from Kathwai, Salt Range

A critical reinvestigation was undertaken on the mioflora occurring in beds 25 ft above the Talchir Boulder Bed at Kathwai in Salt Range. The study reveals a number of additional elements in the flora which were so far not recorded. Some of the dominant constituents of the flora, e.g. the saccates and triletes warrant more precise identification in view of its implications on the palaeogeography and age of the Kathwai fossil locality.

2.5. Palaeozoic Coals from Abroad

2.5.1. *Palynostratigraphy of Lower Gondwana deposits in Parana & Maranhao Basins, Brazil*

Lower Gondwana palynofossils in the subsurface samples from Parana and Maranhao basins have been studied. Six palynological zones have been proposed on the basis of abundance of different spore-pollen taxa constituting stratigraphic sequence commencing from the Itarare subgroup at the bottom and extending to Irati Formation at the top. These zones have also been compared with known palynological sequence from Antarctica, Argentina, Australia, Zaire, India and Uruguay. The occurrence of some characteristically North-American-West European Upper Carboniferous spore genera in the Lower Permian of Brazil has been interpreted to be confirming the geological nearness of these regions as compared to India, Antarctica and Australia during Carboniferous and Permian periods.

3. MESOZOIC

3.1 Megafossil Assemblages

3.1.1. *Triassic Flora*

A. Fossil plant remains from Ramkola — Tatapani Coalfield, Madhya Pradesh have been described from three different localities. On the basis of the presence of *Lepidopteris* the beds at Ledhonala, about 3 km NW of Karamdiha, have been assigned a Lower Triassic age. The other two localities may be either of Uppermost Permian or of Early Triassic age.

B. Plant megafossils recovered from near Asansol are *Schizoneura gondwanensis* Feistmantel, *Pecopteris concinna* Presl., *Cyclopteris pachyrhachis* Goppert, a few species of *Glossopteris*, *Macrotaeniopteris* sp., *Cordaicarpus* sp., *Dicroidium*/*Lepidopteris* ?cf. *Kendostrobus*, *Taeniopteris* sp. cf. *T. stenoneuron* (Schenk) Pascoe, *Podozamites* sp. cf. *P. lanceolatus* Lindley & Hutton.

C. A new ginkgoalean remain *Ginkgoites goiraensis* n. sp., has been reported from the Triassic sediments of South Rewa Gondwana Basin.

D. Taxonomic identification of *Lepidopteris*/*Dicroidium* on the basis of cuticular structure was undertaken from the Triassic of the South Rewa Basin.

E. Compilation of a monograph on the Triassic megafossils from India has been undertaken. The species belonging to *Trizygia*, *Schizoneura* and *Glossopteris* have been partly studied.

3.1.2. *Jurassic-Cretaceous Flora*

A. Work was carried out on some species of *Ginkgo*, *Thinnfeldia* and some fructifications from Pathargama, Rajmahal Hills, Bihar. The paper on Indian *Dictyozamites* has been completed. The study of the Indian Mesozoic cycadophytic leaves was confirmed.

B. A paper on three species of *Ptilophyllum* and some cycadophytic leaves from the Jabalpur Series has been sent for publication. The work on some pteridophytes and *Allocladus* is almost ready for publication. Descriptions and comparisons of certain species of *Pachypteris, Taeniopteris, ? Nilssonia, Ptilophyllum, Araucaria, Brachyphyllum, Pagiophyllum, Araucarites* and some new forms have been completed.

C. The first draft description and comparison of *Isoetites* (2 sp.), *Equisetum* (1 sp.), *Gleichenites* (1 sp.), *Matonidium* (1 sp.), *Hausmannia* (1 sp.), *Cladophlebis* (2 sp.) and *Sphenopteris* (1 sp.) from Gujarat have been completed. Photographs and text-figures have been prepared.

D. The descriptive account of some species of *? Cladophlebis, Ptilophyllum, Elatocladus, Brachyphyllum, Pagiophyllum, Araucarites* and *Coniferocaulon* from the Golapilli sandstones have been partly completed.

E. The work on some living and fossil members of Matoniaceae and Gleicheniaceae was continued.

F. Compilation of a monograph on the Lower Cretaceous Flora of India has been taken up. Work on *Equisetum rajmahalense* has been nearly completed.

3.2. Sporae Dispersae and Palynostratigraphy

3.2.1. *Triassic Palynoflora*

Work on a mioflorule from Maitur Formation near Junut, West Bengal has been completed and sent for publication. The solitary productive sample has an assemblage similar to the other Lower Triassic palynological assemblages known from India.

Studies on the ?Middle—Upper Triassic miofloras from two localities in the South Rewa Basin have almost been completed.

The study of megaspores obtained from the ?Middle Upper Triassic of the South Rewa Basin was completed. The paper is almost finalized for Press.

3 2.2. *Jurassic-Cretaceous Palynostratigraphy of India*

A. *Satpura Gondwana Basin*

Palynological samples collected from the section near the confluence of Sukker and Hard rivers near Hathnapur, District Narsinghpur, Madhya Pradesh were macerated. Palynomorph recovery is satisfactory. Slides have been prepared. Slides have also been prepared from six carbonaceous shale samples from Kotri, eighteen samples from Hathidoba and one from Morghat. Some of the slides have been scanned.

B. *Kutch Basin*

Palynological samples from Trambau, Kurbi, Mota Yaksha and Dharesi have been macerated. The samples from Kurbi and Mota Yaksha proved to be barren. Detailed taxonomy of mioflora from the Dharesi section was undertaken.

C. *Kathiawar Basin*

Palynological samples from several quarries near Than, Surendranagar District were macerated. Almost all proved to be unfossiliferous.

D. *Rajmahal Hills*

A few palyniferous slides from Mandro and Sakrigalighat were scanned.

E. *East Coast*

Photography of microspores recovered from Sidheshwar Hill, Orissa was continued.

F. *Pranhita-Godavari Basin*

Study of palaeobotany and palynology of the Kota Formation was continued.

3.3. Mesozoic Coals from Abroad

A. Three tricolpate pollen were isolated from 22 coal samples after repeated maceration from the Mesozoic sediments of Iran for ultrastructural studies.

B. Two papers on the palynology of the Jurassic Stanleyville Formation and the Upper Cretaceous Loia and Bokungu formations in the Samba bore-hole of Zaire were sent for publication. The study of Samba bore-hole palynology has been remarkable in the sense that it has conclusively dated the strata studied as Aptian-Albian whereas earlier these were regarded as basal most Cretaceous on the basis of ostracod evidence.

4. CENOZOIC

4.1. Morphological and Anatomical Studies

4.1.1. *Deccan Intertrappean Flora*

A leaf impression collected from the Deccan Intertrappean beds of Mohgaon Kalan was worked out in detail. The morphological characters of the leaf indicate its affinities with the family Musaceae showing a close resemblance to the leaf of *Musa*. The manuscript has been finalized for publication.

A number of fossil woods belonging to gymnosperms, palms and dicots were worked out. Two papers, one on an araucarian fossil wood from Mohgaon Kalan and the other on fossil woods of *Grewia*, *Sterculia*, *Atlantia*- *Limonia* and *Elaeocarpus*-*Echinocarpus* from Mandla District of Madhya Pradesh, were submitted for publication.

Two palm woods from Mandla District were studied critically and a paper was submitted for publication. One of them shows a prominent lacunar ground tissue throughout the wood. Detailed anatomical study of two more fossil palm woods from Mandla District was also carried out. These were described and photographed. In order to identify these woods and other fossil palm woods, assigned to the artificial genus *Palmoxylon*, a detailed anatomical study of the stem of *Rhapis flabelliformis* was taken up and sections were prepared from different regions to study its anatomical variation. Many sections of *Dracaena* stem were also prepared purposely.

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

Leaf impressions from Panandhro Basin were studied in detail. After examining extensive collection of modern leaves, some of the leaf impressions were identified as *Pandanus, Syzygium, Lagerstroemia, Cinnamomum* and *Terminalia.*

4.1.3. *Leaf-impressions from Khari River Bed*

Leaf impressions from Khari River Bed near Goela-Mokra were identified with the modern taxa which belong to *Cinnamomum, Murraya, Bauhinia* and a palm.

4.1.4. *Fossil Woods from Kankawati Series (Manchar) of Kutch*

A large number of fossil woods from Dhaneti and Mothala, in Kutch District, were investigated and the identification of *Albizia lebbek, A. amara, Dialium, Pterospermum, Dysoxylum-Chisocheton* and *Nephelium-Xerospermum* were co firmed.

4.1.5. *Fossil Woods from Lower Siwalik beds*

A rich collection of petrified woods from the Lower Siwalik beds of Himachal Pradesh and Uttar Pradesh was worked out. Fossil woods resembling to *Polyalthia* of Anonaceae, *Dracontomelum* of Anacardiaceae, *Diospyros* of Ebenaceae, *Anisoptera* of Dipterocarpaceae and *Ormosia*, *Cynometra*, *Afzelia-Intsia* and *Cassia* of Leguminosae were identified.

4.1.6. *Fossil Woods from Eastern India*

A. *Tipam Series*

Investigation of petrified woods from the Tipam sandstones near Hailakandi in Cachar District, Assam was continued. Sections of a number of fossil woods were cut and prepared for study. Six new types of fossil woods were studied in detail and tentatively assigned to *Lagerstroemia* of Lythraceae, *Artocarpus* of Moraceae, *Careya* of Lecythidaceae, *Copaifera-Detarium-Sindora* of Leguminosae and Lauraceae.

B. *Dupitila Series*

Identification of some fossil woods from Namsang River beds near Deomali, Arunachal Pradesh shows closest resemblance with *Sterculia alata*, *Garuga pinnata*, *Albizia lebbek*, *Millettia* spp., *Heritiera* spp., *Mangifera* spp., *Lagerstroemia* spp., and Lauraceae. A paper on these fossil woods has been finalized for publication. The occurrence of *Heritiera* in this region during the Upper Tertiary is of great phytogeographical significance. At present the modern equivalents of this fossil wood, viz., *Heritiera fomes* Buch. and *H. littoralis* Dryander are found in the tidal forests all along the sea shore from Chittagong to Tenasserim and also along the sea coast in tropical south-east Asia, Africa and Australia.

4.1.7. *Fossil Woods of the Cuddalore Series*

Out of a large number of fossil woods studied from Murattandi Chavadi area near Pondicherry, two woods were identified as *Lagerstroemia* and *Tristania* of the family Lythraceae and Myrtaceae respectively. Identification of the fossil woods of *Sterculia colorata, Pericopsis mooniana, Cassia javanica* and *Cynometra ramiflora* was also confirmed.

4.2. Sporae Dispersae and Palynostratigraphy

4.2.1. *Neogene Miospores of India*

A. The pollen and spores recovered from a few macerated samples of Neyveli lignites were identified belonging to the families Polypodiaceae, Schizaeaceae, Guttiferae, Euphorbiaceae, Convolvulaceae, Pedaliaceae, Ctenolophonaceae, Tiliaceae and Olacaceae. The photography of most of these pollen and spores was completed. The pollen grains belonging to Ctenolophonaceae, Rubiaceae and Palmae have been identified as *Ctenolophon, Canthium* and *Sclerosperma* respectively.

B. To identify the fossil pollen and spores, the pollen grains of about 100 species belonging to the families Convolvulaceae, Papaveraceae, Verbenaceae, Boraginaceae, Loganiaceae, Saxifragaceae, Oleaceae, Gentianaceae, Linaceae, Pedaliaceae and Meliaceae were studied, photographed and catalogued.

4.2.2. *Palynopetrographic Study of Organic remains of Coastal and Up-Country Lignites*

A. Scanning and photomicrography of the slides of 8 samples from Neyveli Lignite have been completed. Morphotaxonomic study and quantitative evaluation of various miospore genera were almost complete.

B. Three lignite samples (2 from Akri and 1 from

Panandhro) were macerated and the scanning of the slides was completed. The taxonomic study was continued.

C. Forty Neyveli lignite samples were crushed and out of them 12 pellets were prepared and polished for petrographic study.

4.2.3. *Palynological Study of the Upper Cretaceous-Tertiary Sediments of South Shillong Basin, Lower Assam*

Palynological rock samples collected from Jadukata River, Umnokria Nala, Fall Section 1023 ft., Scarp Section ESE of Cherrapunji, Cherra-Shella Road, Dawki-Punktung Road and Prang River sections were macerated. Microslides were prepared from the productive samples. This was proved helpful for the taxonomic study of plant microfossils and selection of stratigraphic markers.

4.2.4. *Palynostratigraphy of Tertiary Coals of Upper Assam*

A. Morphotaxonomic description upto specific level of the miospore assemblage from samples of various collieries of Makum Coalfield has been completed. Counting of various miospore genera was continued.

B. Twenty three rock samples from Juensang District, Nagaland (sent by the Director, D.G.M., Nagaland) were macerated and all of them proved barren.

C. Maceration of 13 bore-core samples of shales and carbonaceous shales collected from Dilli Colliery was done and only 5 samples yielded spores. Scanning of the slides was continued.

4.2.5. *Palynostratigraphy of Tertiary Sediments, Upper Assam*

A. Ninety six palynological rock samples from Kharsang well-3 were processed and microslides of the productive samples were prepared and catalogued.

B. Twelve palynological flush samples between 486-1962.4 m depth levels of Manabum well—1 were analysed on priority basis for their stratigraphical dating. Results of the investigation were communicated to Oil India Ltd.

C. A consolidated 6 years' report (1970-76) on the progress of the project was prepared and submitted to Oil India Ltd.

D. Microslides prepared from the samples of Jorajan well-2 were scanned and the morphological study of the recovered palynomorphs has been undertaken.

E. Palynological investigations of the Neogene sediments in Nahorkatiya Basin have been completed.

4.2.6. *Resolution of the Age of Barail Equivalent Rocks of Garo Hills*

Laboratory processing of the rock samples collected from Tura-Dalu Road, Sowswari and Dareng rivers has been completed. Taxonomic study of the palynological assemblages recovered from these sections has been started.

4.2.7. *Palynostratigraphy of the Lower Tertiary sediments of Simla Hills & near Jammu*

A. Morphological and taxonomical study of palynomorphs recovered from the Subathu-Dagshai-Kasauli sediments as exposed along the Kalka-Simla Highway sections was continued. Thirty five palynomorph genera (spore-pollen as well as microplankton) represented by 75 species were identified and described. Of these, one genus and twenty species are new. Quantitative analysis of the assem-

blage has been carried out selecting stratigraphically important species. Palynostratigraphical correlation of the different sections was continued.

B. Distributional pattern of the significant palynomorph complexes within the Subathu Formation in relation to the changing environment of deposition was worked out. A paper is ready for publication.

4.2.8. *Palynostratigraphy of Marine Cretaceous-Tertiary Sedimentary Rocks near Pondicherry, Tiruchirapally & Quilon, South India*

A. *Microplankton Study of Upper Cretaceous Sediments of Cauvery Basin*

Laboratory processing of rock samples collected from Kunnum and Anaipadi sections has been completed. Scanning of productive slides with microphotography of important dinoflagellates and miospores has also been completed.

Morphological study of Uttatur Radiolarians is in progress. Twenty genera belonging to five Nassillarian families of Polycystine Radiolarians have been identified.

Taxonomic study of Dalmiapuram grey shale has been completed assessing the age of the assemblage to be Lower Albian. A paper has been sent to Press.

Morphographic reinterpretation of some species of the genus *Dinogymnium* has been proposed with a remark on its palaeogeographic and stratigraphic distribution. A paper has been sent for publication.

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

Morphological study of microplankton from Edavai, Varkala and Chanakkodi sections was continued.

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

A. Palynostratigraphy of Maniyara Fort Formation (Oligocene) in the district of Kutch has been completed. On the basis of palynomorphs, the following three cenozones have been proposed as :

(3) *Aplanosporites flagellatus* Cenozone
(2) *Trisyncolpites oligocenecus* Cenozone
(1) *Polysphaeridium microtriainum* Cenozone

The Oligocene miospore assemblage has also been distinguished from the Eocene one.

B. Palynomorphs from the Harudi Formation (Middle Eocene) in the district of Kutch have been systematically described for the first time. This assemblage is characterized by the dominance of *Proxapertites, Palmaepollenites, Scantigranulites* and *Couperipollis.*

C. On the basis of dominance of taxa, *Triorites triangulus* Cenozone has been proposed for the Lower Eocene while *Proxapertites microreticulatus* Cenozone has been established for the Middle Eocene in Kutch. The Lower and Middle Eocene palynological assemblages have also been differentiated from one another.

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

Manuscript dealing with the palynology and stratigraphy of Madh Formation in the type area has been finalized.

4.3. Tertiary from Abroad

4.3.1. A paper on the fossil woods from the Tertiary of Burma, as *Careya, Albizia, Swintonia, Lagerstroemia, Shorea* and *Araucaria—Agathis* was finalized and sent for publication. *Dipterocarpoxylon holdeni* Gupta was further reinvestigated and found belonging to *Cynometra.*

4.3.2. One paper on the fossil woods of *Millettia pendula, Cynometra inaequifolia, Afzelia cochinchinensis, Anogeissus acuminata* and *?Careya arborea* from the Tertiary of Thailand was sent for publication.

5. QUATERNARY

5.1. Plant Megafossils from Karewa beds of Kashmir

Leaf impressions from Laredura, Kashmir were further examined and some leaves of fern, *Pteridium* and seedlings of *Pinus* were recorded for the first time.

5.2. Pollen Morphology

5.2.1. *Rajasthan Pollen Flora*

Pollen grains of 48 species belonging to various orders of Rajasthan flora were photomicrographed.

Pollen diagnoses of nearly 500 Indian plant species were compiled. A detailed pollen morphology and photography of Indian Ebenaceae has been completed. Pollen slides of nearly 50 samples of *Cedrela toona* have been prepared. A paper on palynotaxonomy and phylogeny of Indian Symplocaceae and Sapotaceae has been sent for publication. Another paper entitled 'Pollen morphology and interspecific delimitations of Indian species of the genus *Styrax* Linn.' was also sent for publication.

Detailed pollen morphology and photography of Indian Ebenaceae have been completed.

5.2.2. *Alpine Himalayas Pollen Flora*

Three hundred ninety pollen slides of 130 species of Alpine region, distributed in Spiti, Himachal Pradesh were prepared.

5.2.3. *Nilgiris Pollen Flora*

For the identification of subfossil pollen grains recovered from the sediments, 105 plant species, characteristic of Shola Forest in the Nilgiris, were palynologically investigated.

5.2.4. *Nepal Pollen Flora*

The detailed pollen morphological description of 50 species and microphotography of the pollen of 40 taxa have been completed.

5.3. **Pollen Analysis**

5.3.1. *Pollen Zonation Scheme for Western Himalaya, Rajasthan, Gangetic Plain & Nilgiris*

A. *Kashmir Valley*

Pollen analysis of 36 samples from Hirpur and 21 samples from Shirmal sections has been completed. These samples represent Lower Karewa sediments.

B. *Himachal Pradesh*

A paper on some new records of sub-fossil *Sphagnum* from Western Himalaya was sent for publication. In this paper, 4 taxa have been reported from Khajiar (distt. Chamba) and Rewalsar (distt. Mandi). Of these, 3 taxa, viz., *Sphagnum recurvum* P. Beau., *Sphagnum* sp. belonging to Sect. *Sphagnum* (Palustre sensu Abramova) and *Sphagnum* sp. belonging to Cuspidata have been reported for the first

time from Western Himalayas and the fourth, i.e. *Sphagnum teres* is a new record from Himachal Pradesh.

C. *Tsokar Lake, Ladakh*

The palynological analysis of the 23 samples of Borehole TP6 from Tsokar Lake of Ladakh District has been completed. Percentages of pollen types were calculated and pollen diagram was prepared. Three radiocarbon dates (5.15 m) 16260 $\pm$ 1100 B. C., (12 m) 21640 $\pm$ 2100 B. C. and (21.85 m) 31490 $\pm$ 1500 B. C. dates the sequence from the Weichselian Glaciation. An evidence of warm oscillation has been observed at 21.85 m dated by radiocarbon to 31490 B.P.

For pollen analysis, 354 samples from 125.60 m borehole TSD/1 Tsokar Lake, Ladakh were collected from G. S. I., Luknow. 150 modern plants from Ladakh region collected by G. S. I. were also identified at the Forest Research Institute, Dehra Dun.

D. *Garhwal Himalaya*

Pollen analysis of 5 moss cushions from Dehra Dun and vicinity revealed dominance of *Pinus roxburghii pollen*. While *Cedrus, Picea, Abies, Quercus, Betula, Corylus*, etc. were lowly present.

E. *Rajasthan*

One profile each from the lakes Budha Pushkar and Pushkar located in the area of 500-550 mm annual rainfall in vicinity of Ajmer in Rajasthan was pollen analysed and the pollen-diagrams were prepared. Profiles from Pushkar and Budha Pushkar were radiometrically dated back to 1,000 yrs B. P. and 500 yrs B. P. respectively. Pollen sequence from

Budha Pushkar revealed open forests of *Prosopis-Capparis-Zizyphus* series developing into *Acacia-Capparis* series. At Pushkar in the *Anogeissus-Acacia-Rhus* savannah *Anogeissus* eventually dominates. The cerealia type pollen range from 40-90 μm in size.

Pollen analysis of a profile from Didwana salt lake in Rajasthan has been undertaken and 10 samples were macerated.

A paper on origin and history of the Rajasthan desert—palaeobotanical evidence, was sent for the ICAR book for UN Desertification Conference. Another paper on palaeoecology of the Rajasthan desert has also been sent for publication.

One paper on pollen analytical studies at the Nal Lake, Gujarat was also sent to Press.

F. *Gangetic Plain*

A paper on Holocene palynology from Meander Lake in the Ganga Valley, Distt. Pratapgarh, U. P. was almost ready for publication.

G. *Nilgiris*

Six surface samples and moss cushions pollen analysed from Colgrain, Ooty have revealed a good assemblage of both arboreal as well as nonarboreal pollen grains.

5.4. Archaeobotany

5.4.1. *Burzahom, Kashmir Valley*

Four samples of charcoals from the Neolithic Dwelling Pit, 'C' in Stratum D have been identified to species of *Pinus, Parrotia, Cedrus, Celtis* and *Ulmus*.

5.4.2. *Hallur, Karnataka*

Eight samples of charcoals were identified to *Polyalthia* sp., *Anogeissus* sp., *Albizia* sp., and *Holarrhena antidysenterica*.

5.4.3. *Sanganakallu, Karnataka*

Charcoals from nine samples were identified to *Acacia* sp., *Albizia* sp. and *Soymida febrifuga*.

5.4.4. *Koldiwah, Allahabad*

The Neolithic impressions and compressions of rice were identified to *O. sativa*, *O. sativa* var. *O. rufipogon* and *O. nivara* and the chalcolithic ones to *O. sativa* and *O. sativa* var. *sativa*.

The scanning electron micrographic studies of these rice imprints conducted at the International Rice Research Institute, Manila, Philippines revealed that most of the imprints belong to cultivated species of rice

5.4.5. *Ahar, Rajasthan*

Charcoals from two samples have been identified to *Soymida febrifuga*.

5.4.6. *Inamgaon, Maharashtra*

The charcoals from this site were identified to *Dendrocalamus* sp., *Tectona grandis* and *Albizia* sp.

5.4.7. *Eran, Madhya Pradesh*

The charcoals of this site have been identified to *Soymida febrifuga*.

5.4.8. *Harappan Plant Economy*

A. *Kalibangan, Rajasthan*

The Pre-Harappan charcoals have been identified to *Tectona grandis*, *Anogeissus* sp., *Dalbergia* sp. and *Acacia* sp.

The charcoals from the Harappan phase have been identified to *Terminalia* sp., *Albizia* sp., *Dalbergia* sp., *Acacia* sp., *Ficus* sp., *Tectona grandis*, *Tamarix dioica*, *Salvadora persica* and *Boswellia serrata*.

B. *Rojdi, Saurashtra*

The charcoals from this site were identified to *Albizia* sp.

A Ph.D. Thesis entitled "Studies in Archaeobotany together with its bearing upon socio-economy and environment of Indian Protohistoric cultures" was submitted to the Lucknow University. In the thesis are described the archaeobotanical plant remains comprising food grains, oil seeds, nuts, wild seeds and fruits, fibres, fuel and timber yielding plants from four Neolithic sites, four Harappan sites, six chalcolithic sites and five early historic sites.

One paper on further contribution on Protohistoric Ragi—*Eleusine coracana* Gaertn. was prepared and sent for publication. Another paper entitled 'Origin and history of agriculture in the Indian sub-continent' was prepared and submitted for Natural History of Human Populations in India to be published as a special issue of the Journal of Human Evolution (Italy). An article on 'Archaeobotany' was also prepared and submitted for Dictionary of Indian Archaeology to be published by ICHR.

5.5. Quaternary from Abroad

5.5.1. *Central Himalaya, Nepal*

The Pollen analysis of peaty clay profile from Sankhu in

the Kathmandu Valley has been completed and the pollen diagram was constructed. The C-14 dates revealed the profile belonging to the Weichselian.

6. RADIOCARBON DATING LABORATORY

The Radiocarbon Dating Laboratory was formally inaugurated by Shri V. K. S. Varadan, Director-General, Geological Survey of India on 29th December, 1976. The age measurement of samples has now been fully taken up by the Laboratory. This year Governing Body of the Institute has appointed two Committees, namely Radiocarbon Advisory Committee and Sample Priority Selection Committee, to regulate the dating programme and give priority to investigations of utmost importance.

6.1. Dating of Samples

Age measurement of the samples has now been taken up by the laboratory. Eighty five samples including background and standard samples were prepared and measurement carried out. The measured ages of some of the samples and their salient details are as :

6.1.1. *Reconstruction of Past Vegetation & Palaeoenvironment*

Samples from the following localities were submitted by the Quaternary Department of the Institute.

A. *Pratapgarh*

Out of the three sediment samples from a boring at Khuilon, one sample having enough carbon was dated. The date has indicated the commencement of the farming under warm and moist climate.

Age : 4380 $\pm$ 130 years B. P.

B. *Ajmer*

Two samples from a depth profile at Budha Pushkar were dated.

Age : Modern and 436 ± 81 years B. P.

C. *Tsokar*

Four bore core samples from the glacial lake at Tsokar, Ladakh were dated. The ages range from 11,830 ± 500 years B. P. at 3 m depth to 30,600 ± 1,400 years B. P. at 21.85 m depth. The climatic sequence of the area has been derived using these dates.

Age : 30,600 years B. P. for 21.85 m dates the inter-glacial.

D. *Pushkar Lake*

Out of the three bottom sediment samples from a trial trench, two samples having enough carbon were dated.

Age : Modern and 1060 ± 110 years B. P.

E. *Ootacmund*

Four samples from a boring at Colgrain have been dated. The ages do not agree with the stratigraphic sequence.

Ages : Range from 7860 ± 150 years B. P. to 28,245 ± 1040 years B. P.

6.1.2. *Geological Samples (submitted by the G. S. I.)*

A. *Naini Tal Flats*

A piece of wood recovered from the bore-core at a depth more than 30 m was dated.

Age : 1510 ± 100 years B. P.

B. *Darjeeling*

A charcoal sample collected from an excavation across the exposed terrace at Corubathan has been dated. The date is expected to provide some useful information on the tectonism and seismicity of the area.

Age : 248 ± 113 years B. P.

In addition, a number of samples of archaeological, botanical and other interests sent by various organizations in the country were also dated. Eleven intercomparison charcoal samples (dated earlier at the Radiocarbon Lab, P. R. L., Ahmedabad) from Kalibangan, an archaeological site, have also been dated from time to time to check the chemical and radioactive measurement procedures.

6.2. Development of Laboratory

A. A cylindrical mercury shield of 3/4" thickness in a stainless steel container was added to the shielding of the counter. This could improve the background figures slightly.

B. In place of the mercury manometer, a high precision dial manometer was added to the filling system to improve the accuracy of the gas filling into the counter.

C. Several improvements and modifications have bee n made in both glass systems, i.e. the methane synthesis part and the gas filling parts. These have greatly helped the operation trouble free and to a significant saving in the use of liquid air.

D. The construction of electronics unit for the additional counting set up has been completed. Final testing of

the unit is being carried out.

E. One 200 cc Quartz Counter for small quantity samples was assembled, but its operation was not satisfactory. The reassembling of the counter was continued.

6.3. Glass Blowing Shop

It has been able to provide all the required glass wares for the Laboratory. High vacuum glass stop cocks and other required items have also been fabricated in the glass blowing shop. The gas welding of copper and brass parts was also carried out in the blowing shop.

6.4. Workshop

The workshop provided a valuable assistance in the maintenance of equipments and construction of new mechanical devices needed in the Laboratory. The complete machining of counter bodies has also been done in the workshop.

III. PAPERS PUBLISHED

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IV. FIELD WORK

1. The Director and four members of the Palaeozoic Department visited the Raniganj Coalfield for the collection of megafossils from different seams of the Raniganj Stage.

2. The Director and one member of the Palaeozoic Department visited the G. S. I. Museum, Calcutta to study Feistmantel's type and figured specimens.

3. One member of the Palaeozoic Department visited the Hutar Coalfield for palynostratigraphical field work and collection of samples from measured sections.

4. One member of the Palaeozoic Department visited the Indian Statistical Institute, Calcutta to discuss biometric problems in palynology.

5. One member of the Mesozoic Department visited the Jurassic localities near Cormaranche (Bugey-South of Jura) of Orbangnoun, France.

6. One member of the Cenozoic Department went on an excursion to the Deccan Intertrappean beds of Barwaha near Indore during October, 1976. New fossiliferous exposures were discovered and a rich collection of fossil woods was made.

7. Three members of the Cenozoic Department visited Forest Research Institute, Dehra Dun in February-March, 1977. They consulted Xylarium and Herbarium of the Institute for the identification of fossil plants.

8. The members of the Cenozoic Department went to various places in South India during February-March, 1977 for the collection of fossil and living plants. They collected fossil woods from some new Deccan Intertrappean exposures near Nawargaon in Wardha District, Maharashtra and from

the Cuddalore Sandstones near Pondicherry, Lignite samples from Neyveli were also collected for palynological studies. Herbarium specimens along with polliniferous material of about 200 species of flowering plants were also collected from the forests of western ghats in Karnataka and Kerala to prepare pollen slides for these taxa for the taxonomic studies of Neogene miospores.

9. Field excursion to Simla Hills was undertaken by the two members of Oil Department from 29 March to 2nd May, 1976. Several subsidiary Nala Sections of the Subathu Formation were measured. Stratigraphically located rock samples were also collected for palynological analysis. An area of about twenty eight sq km around Subathu (type locality) was mapped.

10. Field excursion to Cauvery Basin and Western Ghats was undertaken by the members of Oil Department from 8 March to 1 April, 1976 to collect stratigraphically located rock samples from the localities near Ariyalur, Vridhachalam, Kallakkudi, Siva Ganga and Trivandrum representing Cretaceous-Tertiary formations.

11. A member of Coal Department went on an excursion of Eastern Region of India, with a party of Foreign delegates of the 4th I. P. C.

12. A party of Coal Department visited Wardha Valley Coalfield during March-April, 1977. Samples were collected from Penganga, Irai and Wardha rivers.

13. A field trip to Rajasthan was undertaken by two members of the Quaternary Department to study various geomorphological and vegetational aspects of the area. The material for pollen analysis was also collected.

14. One member of the Quaternary Department visited

Forest Research Institute, Dehra Dun in connection with the identification of plants from Ladakh.

V. SPONSORED/COLLABORATIVE RESEARCH

A. PALAEOZOIC DEPARTMENT

A collaborative research study with the ONGC, Dehra Dun on the Pre-Gondwana microbiota from the subsurface of Ganga Valley is under progress.

B. MESOZOIC DEPARTMENT

(i) The collaborative research work with the Geology Section of Indian Statistical Institute, Calcutta is in progress.

(ii) Collaborative work has been undertaken with Dr G. Barale of Botany Department, University of Lyon on some fossil plant remains from Kali Gandhki region, Nepal.

C. CENOZOIC DEPARTMENT

A few leaves from the Holocene of Sirmur District, Himachal Pradesh were studied in collaboration with the Geological Survey of India. Four of them have been identified as *Mallotus philippinensis*, *Celtis australis*, *Prunus* and *Ligustrum*.

D. OIL DEPARTMENT

(i) Palynostratigraphical studies of the Tertiary surface and subsurface rocks of Upper Assam (Project supported by Oil India Ltd., Duliajan, Assam till June, 1976).

(ii) Biostratigraphic studies of the sedimentary succession of Meghalaya-1. Stratigraphic resolution of Komarrah Basin on the basis of microfossils (Project in collaboration with Directorate of Mineral Resources, Meghalaya).

(iii) Biostratigraphical studies of phytoplankton in the

Marine Tertiaries of Kutch and adjoining areas (in collaboration with Geology Department, Lucknow University, Lucknow).

(iv) Palynostratigraphic studies of Lower Tertiary rocks of Northern India (in collaboration with Geological Survey of India).

E. COAL DEPARTMENT

Coal India Limited, Directorate of Geology and Mining, Nagaland ; Neyveli lignite Corporation ; Directorate of Geology and Mining, Gujarat ; and International Coal and Lignite Nomenclature and Analysis Commissions of I. C. C. P.

F. QUATERNARY DEPARTMENT

(i) Pollen analysis of Tsokar Lake materials provided by Geological Survey of India.

(ii) Archaeobotanical materials provided by Archaeological Survey of India and Department of Ancient Indian History and Archaeology, Kurukshetra University Haryana.

(iii) Palynotaxonomy of *Cedrela toona* materials from Forest Research Institute, Dehra Dun.

VI. TRAINING PROVIDED TO OUTSIDERS

1. Mr B. P. Patra, Utkal University, Bhubaneshwar.
2. Mr M. S. Rawat, Asst. Prof. of Botany, Post-Graduate College, Sehore (M. P.)
3. Mr M. D. Kajale, Deccan College, Poona.
4. Dr Mool Chandra Gupta, G. S. V. M. Medical College, Kanpur.

5. Mr Shailendra Mehra, Geological Survey of India, Western Region, Jaipur, Rajasthan.

6. Miss Sunita Goswami, School of Morphological Studies, Meerut.

VII. TECHNICAL ASSISTANCE TO OUTSIDERS

1. Neyveli Lignite Corporation.

2. Directorate of Geology & Mining, Nagaland.

3. Directorate of Geology & Mining, Gujarat.

4. Oil India Ltd., Duliajan, Assam (till 30.6.1977).

5. Directorate of Mineral Resources, Meghalaya.

6. Archaeological Survey of India.

7. Department of Ancient Indian History and Archaeology, Kurukshetra University, Haryana.

8. Forest Research Institute, Dehra Dun.

9. Geological Survey of India (Northern Circle and Himachal Pradesh), samples of Shali and Mandhali.

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

Dutta, S. K. & Singh, H. P.	Palynology of the Siwalik rocks of the lesser Himalaya, Kameng District, Arunachal Pradesh.	IV I. P. C., Lucknow.
Lele, K. M. & Chandra, A.	Talchir miofloras from South Rewa Gondwana Basin, India and their biostratigraphical significance.	IV I. P. C., Lucknow.

Lele, K. M. & Srivastava, A. K.	Lower Gondwana (Karharbari-Raniganj Stage) miofloral assemblages from the Auranga Coalfield and their stratigraphical significance.	IV I. P. C., Lucknow.
Maithy, P.K.	Microbiota from the Suket shales, Ramapura, Vindhyan.	Symposium on Vindhyans held at Bhopal in Nov., 1975 sponsored by G.S.I., Central India & Directorate of Geology and Mining, M.P.
Maithy, P.K.	Precambrian biota from Gondwana continents—a synthesis.	IV I. P. C., Lucknow.
Navale, G. K. B.	Evaluation of Genetic Coal types of palynological methods.	IV I. P. C., Lucknow.
Navale, G. K. B.	Depositional environment of Lower Gondwana coals of India.	IV International Gondwana Symposium held in Calcutta in January, 1977.
Sah, S. C. D. & Singh, R. Y.	Palynological demarcation of the Cretaceous-Tertiary sediments in Assam Basin.	IV I. P. C., Lucknow.

Sah, S. C. D. & Singh, R. Y.	Cretaceous-Tertiary Boundary in Assam.	Seminar on Oil Exploration Programmes along the East Coast of India, Bangalore.
Sah, S. C. D., Singh, R. Y. & Singh, H. P.	Palynological zonation of the Neogene sediments in Nahorkatiya Basin, Upper Assam.	IV I. P. C., Lucknow.
Sharma, C. & Gupta, H. P.	Pollen morphology and interspecific delimitations of the genus *Styrax Linn.*	IV I. P. C., Lucknow.
Singh, H. P. & Khanna, A.K.	Palynology of the Palaeogene marginal sediments of Himachal Pradesh, India.	IV I. P. C., Lucknow.
Sukh-Dev	Evaluation of *in situ* spores and pollen grains from the Jurassic-Cretaceous fructifications.	IV I. P. C., Lucknow.
Tiwari, R. S.	Palynostratigraphy of Permo-Triassic transition in India.	IV I. P. C., Lucknow.
Vishnu-Mittre	Quaternary vegetational history in India.	IV I. P. C., Lucknow.
Vishnu-Mittre	Possible significance of Pre-Neolithic cereal type pollen in South Asia.	IV I. P. C., Lucknow.

Vishnu-Mittre	Environmental background to the Mesolithic cultures in India.	III Conference, Ethnography, Folk culture & Indian Association.
Vishnu-Mittre	Presidential Address.	IV I. P. C., Lucknow.

VIII B. RADIO TALKS

Bharadwaj, D. C., Lele, K. M. & Maheshwari, H. K.	Palynology in the service of humanity (a discussion)	AIR, Lucknow.
Maheshwari, H. K.	Pattharon mein paudhe (Talk in Hindi)	AIR, Lucknow.

IX. REPRESENTATION ON COMMITTEES/BOARDS

Anand-Prakash
- ... Incharge, Central India Excursion during IV I. P. C.
- ... Recorder, IV I. P. C.

Awasthi, N.
- ... Member, Pre-Conference Publication Committee, IV I. P. C.

Bharadwaj, D. C.
- ... Vice-President, International Commission on Palynology.
- ... Chairman, Organizing Committee, IV I. P. C.
- ... Member, IV International Commission on Carboniferous Stratigraphy.
- ... Member, Editorial boards of 'Review

	Palaeobotany and Palynology', 'The Palaeobotanist' and 'Geophytology'.
Bose, M. N	... Member, Editorial Board, 'The Palaeobotanist'.
	... Member, Apex Committee, IV I.P.C.
	Convener, Accommodation Committee, IV I. P. C.
Gupta, H. P.	... Member, Executive Committee, The Palaeobotanical Society.
	... Member, Pre-Conference Publications Committee, IV I. P. C.
Jain, K. P.	... Member, Executive Committee, The Palaeobotanical Society.
	... Secretary, Organizing Committee, IV I. P. C.
Kar, R. K.	... Assistant Secretary, Organizing Committee, IV I. P. C.
	... Foundation Fellow, Indian National Earth Sciences Academy, Calcutta.
Kulshreshtha, S. K.	... Member, Exhibition Committee, IV I. P. C.
Lakhanpal, R. N.	... Member, Editorial Board, 'The Palaeobotanist'.
	... Member, Apex Committee, IV I. P. C.
Lele, K. M.	... Joint Secretary General, Organizing Committee, IV I. P. C.
	... Member, Apex Committee, IV I. P. C.
	... Member, Programming Committee, IV I. P. C.

... Member, Editorial Sub-Committee. IV I. P. C.

... Member, Sub-Committee on 'Permian-Triassic Time Scale', IV International Gondwana symposium, Calcutta, 1977.

Maheshwari, H. K. ... Member, Committee for Fossil Plants, International Association for Plant Taxonomy.

... Member, Executive Committee, The Palaeobotanical Society.

... Additional Secretary, Organizing Committee, IV I. P. C.

... Division Secretary, IV I. P. C.

... Member, Publicity & Press Committee, IV I. P. C.

... Member, Editorial Sub-Committee, IV I. P. C.

... Incharge, Publication Committee, IV I. P. C.

Maithy, P. K. ... Member, Executive Committee, The Palaeobotanical Society (upto December, 1976).

... Editor, Geophytology.

... Incharge, Entertainment Committee, IV I. P. C.

... Division Secretary II, IV I. P. C.

Navale, G. K. B. ... Member, International Committee of Coal Petrology.

... Member, 'Special Committee',

	Gondwana Coal, I. C. C. P.
	... Member, International Commission on Coal and Lignite Nomenclature.
	... Member, International Commission on Coal and Lignite Analysis.
	... Member, Organizing Committee of Coal Petrology.
	... Secretary, Organizing Committee, IV I. P. C.
	... Division Secretary, IV I. P. C.
Prakash, U.	... Chief Editor, 'Geophytology'.
	... Joint Secretary, Apex Committee, IV I. P. C.
Pramod-Kumar	.. Member, Organizing Committee, IV I. P. C.
Singh, H. P.	... Secretary, Organizing Committee, IV I. P. C.
	... Joint Secretary, The Palaeobotanical Society.
	... Member, Editorial Sub-Committee, IV I. P. C.
	... Member, Committee of Bibliography of Indian Palynology.
Singh, R. Y.	... Member, Organizing Committee, IV I. P. C.
Srivastava, S. C.	.. Member, Pre-Conference Publications Committee, IV I. P. C.
	... Member, Press & Publicity Committee, IV I. P. C.

Sukh-Dev	... Member, Executive Committee, The Palaeobotanical Society (upto December, 1976).
Tiwari, R. S.	... Editor, 'Geophytology'.
	... Division Secretary, IV I. P. C.
	... Member, Editorial Sub-Committee, IV I. P. C.
	... Incharge, Press & Publicity Committee, IV I. P. C.
	... Symposium Convener, Ist Indian Geophytological Conference, Lucknow, 1975.
Vishnu-Mittre	... Member, International Palynological Commission.
	... Member, Central Advisory Board of Archaeology.
	... Member, Committee to organize the National Museum of Man for Ministry of Education & Social Welfare.
	... Member, Committee for Garhwal University for programming and nature of studies and courses for Institute of Himalayan studies.
	... Member, Subsector Allergy & Applied Immunology, Science & Technology Department, S. C. S. T., U. P.
	... Member, Apex, Programming, Finance, & Editorial Committees, IV I. P. C.

... Division President, IV I. P. C.
... Convener & Chairman, Symposium, IV I. P. C.

X. DEPUTATION/RAINING/STUDY ABROAD

The Director, along with two members of the Institute attended the IV International Gondwana Symposium held at Calcutta. Dr Shaila Chandra attended the meeting of the working Group 7 by special invitation.

M. N. Bose

Visited the following countries during 1st April—18th April, 1976.

U. K. : Reading and London. In Reading discussed problems concerning Mesozoic Palaeobotany with Prof T. M. Harris. In London examined some of the Indian type specimens in the British Museum (1st April—7th April, 1976).

BELGIUM : Worked at the Musee' Royal de l' Afrique Centrale, Tervuren (7 April—14 April, 1976).

FRANCE : Examined the Jurassic collections from France at the University of Lyon (14 April-18 April, 1976).

R. N. Lakhanpal

Under the programme of Scientific Exchange and Scientific cooperation between Indian National Science Academy and the U. S. S. R. Academy of Sciences, Dr R. N. Lakhanpal went to U. S. S. R. for 4 weeks in July, 1976. He visited the Palaeobotany Section of the Geological Institute in Moscow ; Komarov Botanical Institute and VSEGEI in Leningrad ; and a Tertiary fossil locality near Daretsk in Ukraine.

From August 2-8, 1976, he spent in the Palaeobotany

section of the Swedish Museum of Natural History, Stockholm.

Next two weeks, August 8 - 22, 1976, he was in U. K. visiting the Palaeobotany and Botany Branches of the British Museum of Natural History, London ; Laboratory of Professor T. M. Harris in Reading ; Botany Department, University of Leeds ; and the Botany School, Cambridge.

During this tour abroad Dr Lakhanpal saw Tertiary plant fossils in the different centres and acquainted himself with the recent trends in palaeobotanical research being carried out there.

Shyam C. Srivastava

Working at Department of Botany, University of Texas, Austin, U. S. A. under the Government of India National Scholarship.

XI. HONOURS AND AWARDS

Vishnu-Mittre ... Awarded Fellowship of the Palaeobotanical Society

Uttam Prakash ... Awarded Fellowship of the Palaeobotanical Society

K. M. Lele ... Awarded Fellowship of the Palaeobotanical Society.

A. K. Srivastava ... Awarded the Ph.D. Degree for his work on 'Contribution to the Knowledge of *Glossopteris* flora from Auranga Coalfield, Bihar' from the Lucknow University.

J. P. Mondal ... Awarded the Degree of D.Phil.

for his work on 'Morphology, anatomy and taxonomy of Indian Lycopodiaceae' from the University of Burdwan.

R. K. Saxena ... Awarded the Ph.D. Degree for his work on 'Palynostratigraphy of Matanomadh Formation (Palaeocene) in the type area, in the district of Kutch, Western India' from the University of Lucknow.

XII. FOUNDERS DAY CELEBRATIONS

The Founder's Day was celebrated on 14th November, 1976 the birthday of Professor Birbal Sahni, F. R. S.

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

Mr N. F. Hughes, Sedgwick-Museum, University of Cambridge, England delivered the 6th Birbal Sahni Memorial Lecture titled "Mid-Cretaceous seed plants" on 30th December, 1976 at 5.00 p. m.

On 1st January, 1977 at 5.00 p. m. Professor F. P. Jonker, Laboratory of Palaeobotany and Palynology of the State University of Utrecht, the Netherlands delivered the 24th Sir Albert Charles Seward Memorial Lecture entitled "The tendency concept : a view focussed on the evolution in the Plant Kingdom".

XIII. PUBLICATIONS

1. The Journal — 'The Palaeobotanist'

(a) Volume 23, numbers 1 to 3 were published during the year.

(b) Volume 24, numbers 1 to 3 were sent to Press. Page proofs of 24(1) and galley proofs of 24(2) were received from the Press. They were duly corrected and returned.

2. Sir Albert Charles Seward Memorial Lecture

Twentythird lecture titled "Reconstructing the past climate and environment" delivered by Prof. D. P. Agrawal was sent to Press and published during the year.

The manuscript of Twentyfourth lecture entitled "The tendency concept : a view focussed on the evolution in the Plant Kingdom" by Prof F. P. Jonker was received and sent to Press.

3. Birbal Sahni Memorial Lecture

The Fourth lecture titled "Moulds, mushrooms and men" delivered by Dr C. V. Subramanian was published during the year. The fifth lecture "Growth of ideas in generation and migration of oil over last 20 years" by Prof B. G. Deshpande was also published.

Manuscript of the 6th lecture titled "Mid-Cretaceous seed plants" delivered by Mr N. F. Hughes was received and sent to Press.

4. Silver Jubilee Lecture

Fourth lecture entitled "Fruits of exploration of moon and neighbouring planets" by Professor D. Lal was published during the year.

5. A Catalogue of Indian Fossil Plants

This was an important publication published in a book form during the year. It comprises an alphabetical listing

of all the available records of fossil plants from India published during the period 1821 to 1970. The book is fully cloth-bound and carries 318 pages.

6. IVth I. P. C. Publications

For the IV International Palynological Conference, three publications, viz., 'Lucknow' (a souvenir brochure) ; 'Palynology in India - A Report' ; and 'Abstracts' were published. A booklet namely, 'Programme' was also published for the conference held at the Institute.

7. Annual Report

Annual Report for the year 1975-76 was published and distributed.

8. Sale

To promote the sales of the Institute publications a pamphlet containing the list of all publications published so far by the Institute was published and distributed. During the year under review an income of Rs. 60,347.51 was registered from the sale proceeds of the Institute publications. The sum includes the following foreign exchange earned.

U. S. Dollars	3,811.45
£	229.76

XIV. LIBRARY

1. Statement showing the Details of Stock for the Year 1976-77

	DETAILS	POSITION ON 31-3-76	ADDED DURING 1976-77	TOTAL
(i)	Books	2927	125	3052
(ii)	Journals	6205	140	6345
(iii)	Reprints	22696	400	23096
(iv)	Microfilms	217	—	217
(v)	Theses	12	3	15
(vi)	Maps	31	9	40

2. Exchange Programme

(i) Number of papers purchased for exchange	27
(ii) Total number of reprints sent out on exchange	6299
(iii) Number of Institutions on exchange	61
(iv) Number of individuals on exchange	325
(v) Sets of papers of Prof Sahni's published work sent out.	6

Quite a number of scientific workers from all over world expressed their desire of setting exchange relations with the Library and almost most of them have been included in our exchange list. During the IV International Palynological Conference an extensive use of library was made by the delegates.

3. During the year library services were availed by the scientists from Lucknow University, Geological Survey of India, National Botanic Gardens, Central Drug Research Institute, King George Medical College and also other local and outside organisations. The total number of registered users of the library went up from 89 to 91 this year.

4. A number of important publications were lent and borrowed from the local and out-station organisations by the library under the Inter-Library-Loan-Programme.

5. To accommodate the reference-needs of visiting scientists during the IV International Palynological Conference a number of stacks were added and guides, posters and direction-placards were placed. Journals were also i olated according to their proper use. The new arrangement enables more comprehensive open access. New units introduced during the year were symposia, reference, micrcdocuments, current journals and publications for exchange.

In the microdocument unit Palaeobotany and Palynology sections were made separately and the literature of both sections was rearranged alphabetically. Besides, microplankton, archaeology, archaeobotany, aeropalynology and museology sections were also introduced tor the first time in this unit.

6. Library received kind donations of old Ph.D. theses from most of the Institute members.

7. Quite a few out-of-print and old literature was reconditioned and about 700 journals were bound during the year.

XV. MUSEUM

A. Exhibition & Store Halls

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

A number of very well preserved specimens of Glossopteridales fructifications in one separate show case have been displayed. A huge fossiliferous-block collected from Orissa

containing large and complete *Glossopteris* leaves has been added to this hall. New printed labels of fossils alongwith author's name have been placed in both the ground and wall show cases.

The relief map of India, the model section through an oil field and all the reconstruction models were repainted and repaired. The wooden letters on the Foundation Stone have been replaced by new bronze letters in order to give a better look. Wooden name plates of all the show cases, reconstruction models and fossiliferous blocks (including those displayed in the Central Hall) have been replaced by the plastic ones. The legends of the Geological clock prepared by plastic letters have been fixed over it. The cloth of the wall and ground show cases have been changed. Old palaeogeographic maps in all the wall show cases have been replaced by new ones.

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

This hall has now been opened for the visitors. All the stores from this hall have been shifted to the basement. New printed labels have replaced the old labels. Cloth and legends for all the show cases have been changed.

All the fossiliferous-blocks and charts on the hard board have been polished. Few algal fossils have been added to the Pre-Cambrian show case. Following three maps have been displayed in this hall.

(i) Bathymetric World

(ii) Raised Relief Map of India

(iii) Ocean Feature Model

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

The stores from the Botany Hall (Hall no. 2) have been

properly arranged in this Hall. Steel cabinets, meant for keeping the type and figured specimens, have been kept in the gallery of the basement. The newly collected fossils were properly catalogued, numbered and stored as usual.

B. Type & Figured Specimens/Slides etc.

The number of type and figured specimens and slides kept in Prof Sahni's room on 31.3.1977 :

Type and figured specimens	...	1417
Type and figured slides	...	5267
Negative of type and figured specimens and slides	...	3790

The checking of the type and figured specimens was nearing completion while that of type and figured slides was under progress. More duplicate fossils were deposited by the workers.

C. New Collections

During the year collections were made from about 57 localities of India by the Institute staff. The details are as follows :

Palaeozoic Dept.	... 167	specimens and samples	
Mesozoic Dept.	... 326	,,	,,
Tertiary Dept.	... 311	,,	,,
Quaternary Dept.	178	Samples	
Oil Department	.. 77	..	
Coal Department	191	..	

D. Specimens Received for Investigation

1. Five samples were received from the Director, Himalayan Geology Division, Northern Region, Geological

Survey of India, Lucknow. The report of the investigations has been communicated.

2. Three samples from Dy Director-General, Northern Region, Geological Survey of India, Lucknow were received for palynological investigations. The report has been sent to him.

3. Two slides from Prof Sunder Rao, Department of Botany, University of Saugar (M. P.) were received for identification. The results have been communicated.

4. Samples for palynological studies of Tsokar Lake, Ladakh were received from Director, Division of R. I. S., Geological Survey of India, Lucknow. The results of the investigations have been sent.

5. Three samples of Naini Tal area sent by the Director, Geological Survey of India, Engineering Geology Division (E), Northern Region, Lucknow were analysed and the report has been sent to him. One wood sample was also received from the same organisation and the results have been communicated.

E. Presentation of Duplicate Fossils

Representative plant fossils from different horizons of India have been presented to :

1. Prof M. A. Rama Chandra Rao, M. A., Principal, Government College, Mangalore (Karnataka).
2. The Head & Professor, Department of Botany, Banaras Hindu University, Varanasi.
3. Prof Yves Lemoigne, Universite De Lyon, Department De Biologie Vegetale, 43, Bon, Du 11, Novembre 1918, 69, Villenrbanne, France.

4. Mr N. Subramanyam, Department of Botany, Ruparel College, Senapati Bagpat Marg, Bombay-16.

5. Prof D. D. Pant, Professor & Head, Department of Botany, Allahabad University, Allahabad.

6. Botany Department, Madras Christian College, Tambaram.

7. Department of Botany, Christ Church College, Kanpur.

8. Dr M. Nagraj, Department of Botany, Central College, Bangalore University, Bangalore.

9. Department of Botany, P. P. N. College, Kanpur.

10. Prof K. S. Valdiya, Head, Department of Geology, Kumaon University, Naini Tal, U. P.

11. Principal, Delhi Public School, R. K. Puram, Delhi.

F. **Visitors During the Year**

1. *Institutions*

(i) Botany Department, University College of Science, University of Calcutta, Calcutta.

(ii) Sahkari Inter College, Miharawani, Distt: Jaunpur.

(iii) Arya Vidyapeeth College, Gauhati, Assam.

(iv) Botany Department, U. P. College, Varanasi.

(v) Botany Department, Rajendra College, Chapra.

(vi) Biology Department, D. A. V. College, Amritsar.

(vii) Botany Department, Madhav Vigyan Mahavidya-

laya, Ujjain.

(viii) Botany Department, D. H. S. K. College, Dibrugarh, Assam.

(ix) Botany Department, Jamshedpur Cooperative College, Jamshedpur.

(x) Botany Department, B. N. College, Dhubri (Assam).

(xi) Botany Department, S. S. L. Jain College, Vidisha (M. P.).

(xii) Botany Department, Govt. Raza Post-Graduate College, Rampur.

(xiii) Botany Department, Govt. College, Ratlam (M.P.).

(xiv) Botany Department, Shivaji University, Kohlapur.

(xv) Museology Department, Calcutta University, Calcutta.

(xvi) Botany Department, Nagpur University, Nagpur.

2. *Individuals*

(i) Delegates of the IV International Palynological Conference, Lucknow.

(ii) Lt Col. J. R. Saigal, Lucknow.

(iii) Shri Bishwanath Chakrawarty, 16/H, Dover Lane, Calcutta.

(iv) Mr & Mrs A. M. Zutshi, G-3151 A, Model Town, Delhi.

(v) Mr H. Chandra, R. D. S. O., Lucknow.

(vi) Mr & Mrs V. P. Bhatnagar, Dayal Bagh, Agra.

(vii) Mr Sadyabakasod Ilias, Kirghir SSR, Frunze-720040, Dzeejinskaya Streey 30, Institute of Geology, U. S. S. R.

(viii) Mr K. M. Vaid, S. S. O., Botany Branch, FRI, Dehra Dun.

(ix) Dr E. Sinanojhu, T. P. A. O., Arastirma Merkeri, Bahankhlur, Ankara, Turkey.

(x) Mr R. N. Srivastava, Director, G. S. I., East Circle, Patna.

(xi) Mr S. C. Pant, Palaeontology Laboratory, Eastern Region, Calcutta.

(xii) Prof S. B. Bhatia, Punjab University, Chandigarh.

(xiii) Prof J. Ueno, Faculty of Science, Shizuoka University, Japan.

(xiv) Dr Satish K. Srivastava, Chevron Oil Field Research Co., Lahabra, California, U. S. A.

(xv) Prof M. Follien, Rome, Italy.

(xvi) Mr K. N. Mehta, Oil India Ltd., Duliajan.

(xvii) Dr Vsilde Grebe, Geol. Landes and Verfeld, Germany.

(xviii) Dr R. Vanhoorne, University of Anterup, Belgium.

(xix) Mr K. Fowler, Portsmouth, Hauts, England.

(xx) Mr R. P. Phadke & M. C. Suryanarayana, Central Bee Research Institute, Poona.

(xxi) Mr Yasuo Maedg Kobe. Japan.

(xxii) Mr Ramsgoord Pedesen, Geol. Institute, University of Aarhus Deoriarh Dorothy Guy-Ohban (Stockholm Natural History Museum), Sweden.

(xxiii) Mr Wason E. Hale, Smithsonian Institute, Washington, D. C.

(xxiv) Prof Schlipkoter, University of Dusseldorf, West Germany.

(xxv) Mr W. Giggenbach, Chemical Dn., CSIR, New Zealand.

(xxvi) Dr (Miss) S. R. Chitnis and party, Shivaji University, Kohlapur.

H. Section Cutting Unit

This section was completely overhauled. All the machines were polished and set right. Plastic name plates were fixed against every machine. During the year a number of slides of petrified woods and rocks were prepared.

XVI. HERBARIUM

Herbarium Specimens

Addition of plant specimens during the year	213
Total number of plant specimens as on 31.3.77	10,034

Fruit and Seed Specimens

Addition of fruits and seeds during the year	61
Total number of fruits and seeds as on 31.3.77	1,808

Woods

Addition of wood samples during the year	232
Total number of wood samples as on 31.3.77	2,994

Addition of wood slides during the year	319
Total number of wood slides as on 31.3.77	2,502

Pollen Slides

Addition of pollen slides during the year	92
Total number of pollen slides as on 31.3.77	8,225

Other Slides

Total number of slides as on 31.3.77	4,632

Phyllothek

Addition of leaf specimens during the year	6
Total number of leaf specimens as on 31.3.77	133

From the following organisations 195 wood specimens were received in exchange.

1. Deptt. of Environment, Aylesbury, Princes Risborough Laboratory, BUCKS, England. ... 35 specimens
2. L. Cleempoel van Lancker, Paterstraat, TEMSE, Belgium. ... 67 specimens
3. Universidad Nacional de Colombia, Departmento de Recursos Forestales, Laboratorio de Anatomia de la Madera, Colombia. ... 45 specimens
4. Forest Product Laboratory, Madison, Wisconsin, U. S. A. ... 48 specimens

One hundred sixtyseven Indian wood specimens were sent to the following organisations.

1. L. Cleempoel van Lancker, Paterstraat, TEMSE, Belgium. ... 45 specimens

2. Laboratorio de Productos Forestales, Universidad Nacional, Apartado aereo No. 568. MEDELLIN, Colombia, South America. ... 50 specimens

3. Musee Royal, de l'Afrique Central, Teuvern, Belgium. ... 50 specimens

4. Forest Product Laboratory, Madison, Wisconsin, U. S. A. ... 22 specimens

Sixty one seed specimens were received in exchange from National Botanic Gardens, Lucknow.

A set of 50 wood slides was sent to L. Cleempoel van Lancker, TEMSE, Belgium in exchange.

Eighty pollen slides were sent to the following organizations on exchange.

1. Prof Bhoja Raj, Hyderabad (A. P.) ... 33 slides

2. Dr Siwert Nilson, Stockholm, Sweden. ... 3 slides

3. Dr G. Thanikaimoni, Instt. Francais, Pondicherry. 44 slides

A set of 44 pollen slides was received in exchange from Dr G. Thanikaimoni, Instt. Francais, Pondicherry.

Specimens of 4 species of *Equisetum* available in our herbarium were sent to Shri D. K. Saxena, Botany Department, Bareilly College, Bareilly for his monographic studies on this genus.

For providing help in collection of living plant material from Western Ghats, a member of the herbarium staff

accompanied a party of the Cenozoic Department. A good collection of plant material was done by the party from various places in South Canara, Karnataka and Cannanore and Calicut, districts of Kerala. All the plant specimens collected from the above places alongwith the collection of Nilgiris done in 1971 were identified at the herbarium of Botanical Survey of India (Southern Circle), Coimbatore.

The study on the foliar morphology of Hypericaceae and Clusiaceae was continued. The Herbarium Incharge during his visit to South India consulted plant specimens of both the families at Botanical Survey of India (SC), Coimbatore and noted the leaf characters and distributional data purposely.

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

In connection with their research work following botanists consulted the herbarium during the year.

1. Shri R. B. Singh,
   Lecturer in Botany,
   Sindhu Mahavidyalaya, Lucknow.

2. Miss Madhu Ahuja,
   Botany Department,
   Lucknow University, Lucknow.

3. Dr P. C. Kotwal,
   Forest Botanist,
   State Forest Research Institute, Jabalpur.

XVII. BUILDING

Apart from the general maintenance of the Building three lab rooms on the first floor in the western wing and a Maceration Block commenced and a part of the Building

was completed during the year under report. One toilet for ladies on the 1st floor opposite the labs in the western wing was also provided.

A 'Pacca Platform' in one of the lawns was constructed to hold the opening session of the IVth I. P. C. held at the Institute from 29.12.76 to 5.1.77. During the conference special arrangements were also made to keep the Institute neat and tidy.

A few big lab rooms have been partitioned into two unit rooms to provide additional accommodation. The fish aquarium adjacent to the main entrance gate was also renovated. The whole building was distempered and snowcemed on the occasion of the IVth International Palynological Conference.

XVIII. GARDEN

The grasses on the lawns were removed and good ones were transplanted. The hedges and the shrubs on the rockeries were pruned. The lawns and the campus were also properly maintained.

During the Fourth International Palynological Conference the campus was nicely decorated by the annuals and *Bougainvilleas*. The fish aquarium was renovated and it was a general attraction for the delegates. The Samadhi was decorated by flowers during the Conference and also on 10th April and 14th November, 1976.

The Institute garden was adjudged best and was awarded one First Prize and a running Shield for the best maintained lawns within its category in the city. The competition was organized by the State Horticultural Department. The Institute also got four First and two Second Prizes in

Bougainvillea show organized by the National Botanic Gardens, Lucknow.

Some more varieties of *Bougainvilleas* have also been procured to enrich the collection. Cuttings of *Bougainvilleas* were also being tried to propagate them.

XIX. FOURTH INTERNATIONAL PALYNOLOGICAL CONFERENCE

The Fourth International Palynological Conference was held at the Birbal Sahni Institute of Palaeobotany, Lucknow from 29th December, 1976 to 5th January, 1977. One hundred and thirty seven delegates from foreign countries participated in this Conference. The countries represented (with number of delegates in brackets) were, France (23), U. S. A. (22), U. S. S. R. (14), The Netherlands (11), Australia (10), Germany (9), Canada (6), Belgium (5), Japan (4), Sweden (4), Switzerland (4), Czechoslovakia (2), Norway (2) and Denmark, Hungary, Iran, Italy, Nigeria, Madagascar, Singapore, Turkey and Venezuela (with one delegate each). Besides, about 200 Indian delegates representing Geological Survey of India, Oil and Natural Gas Commission, Physical Research Laboratory, V. P. Chest Institute, Bose Research Institute, Oil India Ltd., Bee Research Institute, National Botanic Gardens, French Institute and many Universities and Research Laboratories attended this Conference.

About one hundred and ten foreign delegates participated in the Pre and Post-Conference excursions to South, North-Western, Central and East India.

The Conference was inaugurated on 29th December, 1976 by Prof T. S. Sadasivan, Chairman, Governing Body

of Birbal Sahni Institute of Palaeobotany. The General President, Dr D. C. Bharadwaj, delivered his presidential address on "The significance of Evolution in Palynology". Shri K. D. Malaviya, Hon'ble Minister for Petroleum, who was to inaugurate the Conference, could not come for the occasion. However, he addressed the delegates of the Conference on 31.12.76.

The subjects discussed during the Conference covered some fundamental aspects such as the morphology, taxonomy, physiology and evolution of Palynomorphs and the vegetational history and such applied aspects as the use of Palynology in oil and coal exploration, allergy, medicine, melittology and agriculture besides dating of rocks and problems of stratigraphical boundaries.

The scientific deliberations of the conference, grouped in 6 divisions, were conducted under 29 symposia and non-symposia sessions. The six divisions were :

Div. I—Morphology, Taxonomy and Physiology, Spores & Pollen-grains.

Div. II—Morphology & Taxonomy, Dinoflagellates, Acritarchs, Diatoms, Coccoliths, Chitinozoa, Radiolarians and Microforams.

Div. III—Palynological Stratigraphy & Exploration of Fossil Fuel.

Div. IV—Quaternary Palynology.

Div. V—Palynological Data Handling and Palaeogeography.

Div. VI—Palynology in Medicine, Agriculture, Forestry etc.

In all, 292 research papers were presented. Besides, 5 plenary lectures, 5 special lectures on different aspects

related to Palynology were also delivered by distinguished scientists of India and abroad.

The participants of the Conference also acquainted themselves with the work being done at this Institute and exchanged ideas about scientific matters with the scientists here. This gathering enhanced understanding amongst the participants and possibilities of scientific collaboration between this Institute and other centres of the world engaged in palynological research.

The Birbal Sahni Institute spared no efforts for making this Conference a great success. Besides the scientific deliberations, the arrangements for reception, lodging, boarding, transport, excursions, sightseeing, exhibitions and cultural programmes were highly appreciated by the delegates. All India Radio, Doordarshan and the Press gave a very good coverage to the deliberations.

XX. VISITORS

DISTINGUISHED PERSONS

1. Hon'ble Shri K. D. Malaviya,
   Minister for Petroleum,
   New Delhi.

2. Hon'ble Shri K. C. Pant,
   Minister for Energy,
   New Delhi.

3. Professor William S. Lacey,
   University of Wales,
   England.

4. Mr Jhones E. Canright,
Arizona State University,
U. S. A.

5. Dr G. F. W. Herngreen,
Geological Survey of Netherlands,
The Netherlands.

6. Sqn. Leader R. Krishnan,
Ministry of Defence,
R & D Organisation,
New Delhi.

7. Dr Kazunu,
Osaja City University,
Japan.

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

1. The Governing Body

CHAIRMAN

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

MEMBERS

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

Director,
Botanical Survey of India,

P. O. Botanic Gardens,
Howrah - 711103

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

Dr A. Ramachandran, F. N. A.,
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,
Poona.

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

Shri P. M. Belliappa,
Joint Secretary (Finance)
Department of Science & Technology,
New Delhi-110029

Dr M. N. Deshpande,
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.)

Professor K. R. Surange, F. N. A.,
Director,
Birbal Sahni Institute of Palaeobotany,
Lucknow (Member-Secretary).

Shri Gurcharan Singh,
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

MEMBERS

Dr Joseph P. John,
Principal Scientific Officer,

Government of India,
Department of Science & Technology,
New Delhi-110029

Shri P. M. Belliappa,
Joint Secretary (Finance)
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 K. R. Surange,
Director,
Birbal Sahni Institute of Palaeobotany,
Lucknow.

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

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 of the Botany Department,
University of Allahabad,
Allahabad.

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

Professor Rama,
Tata Institute of Fundamental Research,
Bombay.

Professor B. S. Trivedi,
Professor of Botany,
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 G. Rajagopalan,
Head, Carbon Dating Laboratory,
Birbal Sahni Institute of Palaeobotany,
Lucknow.

XXII. 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. Pbs., 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., (w. e. f. 1.2.1977).

DEPARTMENT OF PALAEOZOIC PALAEOBOTANY

Dr K. M. Lele, M.Sc., Ph.D
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 (Research Scholar w. e. f. 17.5.1976)
Shri D. E. P. Jayasingh (Research Scholar w. e. f. 17.5.1976)

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.
Dr (Miss) Jayasri Banerji, M. Sc., Ph. D.
Shri K. P. Navneetha Kumaran, M. Sc.
Miss Zeba-Bano, M. Sc.
Shri B. N. Jana, M. Sc. (Research Scholar)

DEPARTMENT OF CENOZOIC PALAEOBOTANY

Dr U. Prakash, M. Sc., Ph. D.
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.
Shri Jaswant Singh Guleria, M. Sc.
Miss C. Lalitha, M. Sc. (Research Scholar w. e. f. 21.4.1976)

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. Kulshrestha, M. Sc.
Shri B. K. Misra, M. Sc.
Miss Archana Dwivedi, M. Sc.
Miss Vijaya Rana, M. Sc.
Shri Rakesh Saxena (Research Scholar w. e. f. 2.11.1976).

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.
Dr (Mrs) Asha Khandelwal, M. Sc., Ph. D. (Upto 17.9.1976)
Miss R. Savithri, M. Sc.
Shri A. K. Saxena, M. Sc.
Shri Kamla Prasad, M. Sc.
Shri Amalava Bhattacharya (Research Scholar w. e. f. 24.5.1976).

DEPARTMENT OF OIL PALYNOLOGY

Dr S. C. D. Sah, M. Sc., Ph. D. (on foreign service terms to Wadia Institute of Himalayan Geology, Dehra Dun as Director, w. e. f. 1.2.1976).

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.
Shri A. K. Khanna, M. Sc.

Shri S. K. M. Tripathi, M. Sc.
Shri Rahul Garg, M. Sc.

GEOLOGY SECTION

Shri N. C. Mehrotra, M. Sc.

C-14 LABORATORY

Dr G. Rajagopalan
Shri Govind Jain (upto 18.9.1976)
Dr Raghubir Singh, M. Sc., Ph. D. (upto 30.9.1976)
Shri Ashok Kumar Gupta (w. e. f. 6.12.76 to 27.12.1976)

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)

MUSEUM

Dr Anil Chandra, M. Sc., Ph. D. (Curator)
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.)

Miss Asha Bharadwaj, B. Sc. (J. T. A.)
Miss Madhabi Chowdhury, B. Sc. ,,
Miss Indra Kumari, B. Sc. ,,
Shri D. C. Joshi, B. Sc. ,,
Shri B. Sekar, B. Sc. ,,
Miss Kamla Amarlal, B. Sc. ,,
Shri N. K. Khasnavis, B. Sc. ,,
Shri I. J. Mehra (Lab. Assistant w. e. f. 31.5.1976)
Shri A. K. Ghosh (Electrician w. e. f. 24.11.1976)
Shri K. Rehman (J. T. A. w. e. f. 15.12.1976)
Shri Vijay Singh Panwar (Glass Blower)
Sri P. S. Salujha (Mechanic)

PHOTOGRAPHY AND DRAWING

Shri S. S. Rana (Artist)
Shri P. C. Roy (Photographer)

STORES

Shri Harjeet Singh (w. e. f. 18.10.1976)

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.)

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 (Typist)
Shri R. Devrajan (Typist upto 1.7.1976)
Shri J. L. Sharma (Typist upto 24.12.1976)

Statement of Accounts for the year 1976-77

BALANCE SHEETS AS

LIABILITIES		AMOUNT		AMOUNT	AMOUNT
Capital Funds					
As per 31st March, 1976		33,14,573.90			
Govt. of India Grant on Capital Account during the year		6,00,000.00			
		39,14,573.90			
Recurring Grant used for Capital formation :					
Books & Journals	7,172.72				
Maps & Toposheets	2,464.95				
Electric fixtures & fittings	12,768.38				
	22,406.05	(+) 22,406.05			
		39,36,979.95			
Less Refund out of Capital Grants	11.96				
Less Value written off as per-contra	49.91				
	447.00				
	508.87	(—) 508.87		39,36,471.08	
Add Excess of Revenue grant over Revenue Expenditure				1,79,064.83	
Add Funds provided by other organisation for Capital formation					

PALAEOBOTANY, LUCKNOW

ON 31st MARCH, 1977

ASSETS		AMOUNT	AMOUNT
Land Donated by U. P. Government			32,292.00
Works and Buildings			
As per 31st March, 1976		11,14,657.64	
During the year		3,18,153.60	14,32,811.24
Apparatus and Equipments			
(*A*) *Research Apparatus & Equipments*			
As per 31st March, 1976		7,34,509.60	
During the year		49,516.77	
		7,84,026.37	
Less value refund	6,402.40		
Less value written off as per contra	447.00		
	6,849.40	(—) 6,849.40	7,77,176.97
(*B*) *Workshop Equipments*			
As per 31st March, 1976			62,213.95
(*C*) *Office & Miscellaneous Equipments*			
As per 31st March, 1976		62,361.82	
During the year		7,067.45	69,429.27
(*D*) *Plant & Machinery*			
As per 31st March, 1976		85,471.40	
During the year		1,697.15	87,168.55
(*E*) *Establishment of C-14 Lab*			
As per 31st March, 1976		4,99,422.57	
During the year		1,33,553.89	6,32,976.46

LIABILITIES	AMOUNT	AMOUNT
M. G. T. Scheme (C. S. I. R.)	8,100.79	
Coal Scheme ,,	7,784.66	
Palynology Scheme ,,	5,207.87	
Rajasthan Scheme (Sponsored by University of Wisconsin)	58,913.25	80,006.57
Cost of Land Donated by U. P. Government		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		6,83,039.79
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	6,384.50	
P. K. Srivastava Memorial Fund	2,540.00	
Other Donations	7,383.40	
Dorothy Walton	352.70	22,482.73
Founders Donation Account		1,52,500.00
Burmah Oil Company		1,900.00
Deposit Account		28,746.20
Value of Priced Publications		
As per contra		3,78,871.34
Loans and Advances		
As per contra		29,446.00

ASSETS	AMOUNT	AMOUNT
Apparatus & Equipments (Donated)		
M. G. T. Scheme	7,155.79	
Burmah Oil Company	700.00	
Founders Donation	2,500.00	
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 W. Germany		
(Gift of Microscope)		75,091.50
Vehicles		56,433.65
Furniture & Fixtures		
As per 31st March, 1976	3,82,852.82	
During the year	35,301.53	4,18,154.35
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 & Journals		
As per 31st March, 1976	90,609.59	
During the year	32,834.85	1,23,444.44
Founders Library Donated		50,000.00

LIABILITIES	AMOUNT	AMOUNT
	Total B/F	56,19,450.29
	Total C/o	56,19,450.29

ASSETS	AMOUNT	AMOUNT
Maps & Toposheets		
As per 31st March, 1976	6,742.01	
During the year	2,464.95	9,206.96
Founder's Fossil Collections (Donations)		50,000.00
Donation Account :		
Investments		16,000.00
General Provident Fund		
Investments	4,68,560.93	
Advance out of G. P. F.	75,917.00	
Insurance policies subscribed out of G. P. F. to the extent of	38,032.00	5,82,509.93
Priced Publications in Stock		
"The Palaeobotanist"		
Volumes (1-23)	1,59,262.59	
Symposium	63,500.00	
Autumn School Proceedings	32,900.00	
Monograph	43,150.00	
Seward Memorial Lecture	21,366.00	
Birbal Sahni Memorial Lecture	5,560.00	
Silver Jubilee Lecture	3,245.00	
A Catalogue of Indian Fossil Plants	35,550.00	
Picture Post Cards	14,337.75	3,78,871.34
Loans and Advances		
Festival Advance	3,060.00	
Conveyance advance	26,386.00	22,446.00

LIABILITIES	AMOUNT	AMOUNT
	Total B/F	56,19,450.29
	Grand Total	Rs. 56,19,450.29

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

Sd/- Gurcharan Singh
Registrar
Birbal Sahni Institute of Palaeobotany

ASSETS	AMOUNT	AMOUNT
Sundry Debtors		
For unsettled advances (C. R.) Account	47,578.20	
For unsettled advances (C. N. R.) Account as on 31.3.1977	44,632.55	92,210.75
U. N. E. S. C. O. Book Coupons		793.02
Cash Balance		
At Bank		
Current Account at S. B. I., Lucknow	4,75,293.67	
Savings Bank Account at S. B. I., Lucknow	1,00,529.86	5,75,823.53
In Hand		
Cash in hand (C. R.) Account	138.55	
Cash in hand (Oil India Scheme)	16.16	154.71
	Grand Total Rs.	56,19,450.29

Sd/- S. C. Srivastava
7.6.1977
Section Officer
A. G. II, U. P.

Sd/- A. K. Banerjee
7.6.1977
Inspecting Officer
A. G. II, U. P.

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

INCOME AND EXPENDITURE ACCOUNT

EXPENDITURE	PLAN	NON-PLAN	TOTAL
Academic Expenses			
To Pay & Allowance of Academic Staff	2,53,278.40	5,01,056.71	7,54,335.11
To Field Excursion	6,353.45	6,021.92	12,375.37
To Honorarium to Lecturers			
Birbal Sahni Memorial Lecture	—	350.00	350.00
To Training of Academic Staff		143.47	143.47
To International Programmes			
Deputation Abroad		14,689.79	14,689.79
To Expenses on IV I. P. C.	77,339.60	1,09,093.00	1,86,432.60
To Expenses on Palaeobotanical Society grant disbursement		5,000.00	5,000.00
Expenses on Services Ancillary to Research			
To Pay & Allowances of Auxiliary Tech. Staff	23,338.84	2,17,674.09	2,41,012.93
To Chemical & Glasswares, Photogoods & Small Apparatus etc.	22,267.24	73,697.52	95,964.76
To Library requirements		16,937.95	16,937.95
To Herbarium Requirements		973.10	973.10
To Museum requirements	6,323.52	3,049.68	9,373.20
To Maintenance of Equipment			

OF PALAEOBOTANY, LUCKNOW

FOR THE YEAR ENDING 31st MARCH, 1977

INCOME	PLAN	NON-PLAN	TOTAL
Balance of Last Year's Grant of Revenue A/c Allowed for Expenditure During Current Year, Silver Jubilee and Oil India Grant Account	31,772.39	1,76,587.61	2,08,360.00
By Grants from Government of India of Revenue Account	4,00,000.00	14,25,000.00	18,25,000.00
By Grant from Government of India for IVth International Palynological Conference	1,09,093.00	—	1,09,093.00
By Grant from U. P. Government of Revenue Account		5,000.00	5,000.00
By Grant from Government of India for Palaeobotanical Society		5,000.00	5,000.00
By Grants from other Organisations			
(i) University Grants Commission's Fellowship		3,080.66	3,080.66
By Sale Proceeds of Publications			
(i) The Palaeobotanist		47,087.66	47,087.66
(ii) The Monographs		200.10	200.10

EXPENDITURE	PLAN	NON-PLAN	TOTAL
Apparaturs & Workshop Machinery	8,092.60	—	8,092.60
To Publication Expenses			
"The Palaeobotanist"		34,509.08	34,509.08
Catalogue		19,230.35	19,230.75
Birbal Sahni Memorial Lecture		1,891.01	1,891.01
Silver Jubilee Lecture		872.18	872.18
Annual Report		2,233.83	2,233.83
Seward Memorial Lecture		781.00	781.00
To Travelling and other Allowances			
For Governing Body, Scientific Programmes, and Evaluation Committee and Selection Committee meetings	3,274.65	9,098.31	12,372.96
For attending Scientific meetings and Conferences in India and for other purposes.		9,912.99	9,912.99
For Reimbursement of Medical expenses	1,031.28	14,659.20	15,690.48
For overtime allowances		1,874.94	1,874.94
For Leave travel concession	760.00	2,182.47	2,942.47
To Reimbursement of Tuition Fees	48.00	262.00	310.00
To Child Education Allowance		920.00	920.00

INCOME	PLAN	NON-PLAN	TOTAL
(iii) Symposium & Special Publications		7,890.70	7,890.70
(iv) Seward Memorial Lecture		2,969.30	2,969,30
(v) Birbal Sahni Memorial Lecture		648.82	648.82
(vi) Silver Jubilee Memorial Lecture		609.68	609.68
(vii) Picture Post Cards		641.25	641.25
(viii) Catalouge of Indian Fosil Plants		300.00	300.00
By Miscellancous Receipts and Recoveries			
(i) Vehicle charges		689.63	689.63
(ii) By Telephone charges		1,331.85	1,331.85
(iii) By Visiting Scientist Room charges		140.00	140.00
(iv) By application fees		645-00	645.00
(v) Miscellaneous Recipt & Recoveries	3,557.63	2,242.46	5,800.09
(vi) Recoveries of Conveyance Advance		11,192.00	11,192.00
(vii) Recoveries of Festival Advance		5,220.00	5,220.00
(viii) Interest on Advance (Con. Adv.)		217.61	217.61

EXPENDITURE	PLAN	NON-PLAN	TOTAL
To Pensionary Expenses			
To Supernuation Allowance and Pension		15,918.00	15,918.00
To General Expenses			
To Pay & Allowance of Administrative Staff	4,053.00	2,96,722.76	3,00,775.76
To Telephone & Trunk call charges		12,902.95	12,902.95
To Postage		11,250.00	11,250.00
To Advertisement charges	8,363.71	5,407.76	13,771.49
To Hot & Cold Weather charges		4,244.50	4,244.50
To Petrol & Mobil Oil	3,929.24	3,576.05	7,505.29
To electricity charges	22,838.20	39,380.16	62,218.36
To Municipal taxes		19,503.08	19,503.08
To Insurance of Vehicle & Library		1,056.45	1,056.45
To uniform of Class IVth Staff	1,706.50	5,353.81	7,060.31
To Printing and Stationery	8,602.42	11,835.81	20,438.23
To Custom duty & Port Trust charges		263.60	263.60
To Rly. Ft. Carriage		2,425.61	2,425.61
To entertainment Allow. to Director		1,745.71	1,745.71

INCOME	PLAN	NON-PLAN	TOTAL
(ix] Receipts from IV International Palyno-logical Conference delegates for Conference		12,391.95	12,391.95
(x) C. D. S. Addl. D. A. from R. P. F. Commis-sioner, Kanpur	9,017.60	51,420.50	60,438.10
(xi) Pension Contribution of Dr S. C. D. Sah		2,729.63	2,729.63
(xii) Leave Salary Contri-bution of Dr S. C. D. Sah		2,873.48	2.873.48
Grand Total Rs.	5,53,440.62	17,66,109.89	23,19,550.51

EXPENDITURE	PLAN	NON-PLAN	TOTAL
To Miscellaneous & Unforseen	7,665.42	8,264.29	15,929.71
To Maintenance Expenses			
To Building		37,848.80	37,848.80
To Garden		5,902.72	5,902.72
To vehicle	4,053.87	241.95	4,295.82
To Repairs & Renewals		20,914.91	20,914.91
To Petty Construction		2,477.05	2,477.05
To other Expenses			
To legal advice		257.60	257.60
To Festival Advance		5,400.00	5,400.00
To Oil India Expenses			
To Pay & Allowances		3,862.20	3,862.20
To contingencies		5,000.00	5,000.00
To Silver Jubilee Expenses		19,635.46	19,635.46
To U. G. C. Expenses			
To Fellowship		2,830.66	2,830.66
To Government of India Scholarship Exp.		14,151.29	14,151.29
To Expenditure out of Receipts			
C. D. S. Addl. D. A. from R. P. F. Commissioner, Kanpur	9,017.60	51,420.50	60,438.10
IV I. P. C. Expenditure transferred to I. P. C. Account against Receipts from delegates		11,239.85	11,239.85

INCOME	PLAN	NON-PLAN	TOTAL
Total B/F	5,53,440.62	17,66,109.89	23,19,550.51
Grand Total Rs.	5,53,440.62	17,66,109.89	23,19,550.51

INCOME	PLAN	NON-PLAN	TOTAL
Excess of Income over Expenditure	81,103.08	97,961.75	1,79,064.83
Grand Total Rs.	5,53,440.62	17,66,109.89	23,19,550.51

Sd/- S. C. Srivastava
Section Officer
A. G. II, U. P.

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

INCOME	PLAN	NON-PLAN	TOTAL
Total B/F	5,53,440.62	17,66,109.89	23,19,550.51
Grand Total Rs.	5,53,440.62	17,66,109.89	23,19,550.51

Sd/- A. K. Banerjee
Inspecting Officer
A. G. II. U. P.

Sd/- Gurcharan Singh
Registrar
Birbal Sahni Institute
of Palaeobotany

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

BIRBAL SAHNI INSTITUTE

RECEIPT AND PAYMENT ACCOUNT FOR THE

RECEIPT	PLAN	NON-PLAN	TOTAL
To Opening Balance			
Bank Account (C. R. A/C)	2,88,615.00	1,47,310.94	4,35,925.94
Cash Account		17.27	17.27
Oil India Account			
Bank Account		9,607.78	9,607.78
Cash Account		16.16	16.16
Donation Account			
Bank Account		5,055.23	5,055.23
Silver Jubilee Account			
Bank Account		19,635.46	19,635.46
Refund of Excursion Advance	3,557.63	—	3,557.63
To Govt. of India Grants (Cap. A/c.)	6,00,000.00	—	6,00,000.00
To Govt. of India Grants (Rev. A/c.)	4,00,000.00	14,25,000.00	18,25,000.00
To Govt. of India Grants (Pal. Soc.)		5,000.00	5,000.00
To Govt. of U. P. Research Grants		5,000.00	5,000.00
To Grants from other Organisations			
To University Grants Commission		3,080.66	3,080.66

OF PALAEOBOTANY, LUCKNOW

PERIOD 1.4.1976 TO 31.3.1977

PAYMENTS	PLAN	NON-PLAN	TOTAL
By Opening Balance	—	—	
By Works & Building	3,05,385.22	—	3,05,385.22
By Research App. & Requirements			
By Equipment for services ancillary to Research	47,022.18	—	47,022.18
Photography section	2,304.67	—	2,304.67
Library	26,915.22	—	22,915.22
Herbarium	1,697.15	—	1,697.15
Office & Misc. equipment	31.654.95	—	31,654.95
C-14 Laboratory	89,377.62	—	89,377.62
By Grants paid to Pal. Soc.		5,000.00	5,000.00
By Furniture & Fixtures	35,301.63	—	35,301.63
By Refund of Grants to Government			
Capital Grants	61.87	—	61.87
Silver Jubilee Grants		19,000.00	19,000.00
By Pay and Allowances			
Pay (Academic)	1,81,255.02	3,66,262.97	5,47,518.29
Pay Auxiliary (Technical)	14,773.67	1,35,912.92	1,50,686.59
Pay (Administrative)	2,355.00	1,88,282.39	1,90,637.39
Dearness Allowance	57,070.60	2,29,481.20	2,86,551.80
House Rent Allowance	17,177.80	67,516.82	84,694.62

RECEIPTS	PLAN	NON-PLAN	TOTAL
To Govt. of India Grants for IV International Palynological Conference	1,09,093.00	—	1,09,093.00
IV I. P. C. Receipts from delegates		12,391.95	12,391.95
Sale Proceeds of Publication			
The Palaeobotanist		47,087.66	47,087.66
Monograph		200.10	200.10
Symposium		7,890.70	7,890.70
Catalogue		300.00	300 00
Seward Memorial Lecture		2,969.30	2,969.30
Birbal Sahni Memorial Lecture		648.82	648.82
Picture Post Cards		641.25	641.25
Silver Jubilee Memorial Lecture		609.68	609.68
To Administrative Receipts			
Income Tax	9,216.00	20,923.00	30,139.00
Insurance Premium (S. S. Scheme)	12,198.13	30.229.04	42,427.17
C. T. D. (Post Office)	970.00	4,370.00	5,340.0(
Vehicle charges		689.63	689.63
Telephone charges		1,331.85	1.331.85
V. S. Room Charges		140.00	140.00
Recovery of Advances & Interest under G. P. F.	9,796.00	42,780.00	52,576.00
G. P. F. Subscription	16,454.84	77,712.21	94,167.05
C. D. S. Remitted to R. P. F. Commissioner, Kanpur	17,080.00	69,971.00	87,051.00

PAYMENTS	PLAN	NON-PLAN	TOTAL
City Compensatory Allowance	8,037.85	27,997.26	36,035.11
Children Educational Allowance		920.00	920 00
Over time Allowance		1,874.94	1,874.94
Reimbursement of Medical Expenses	1,031.28	14,659.20	15,690.48
Reimbursement of Tuition fees	48.00	262.00	310.00
Leave travel concession	760.00	2,532.47	3,292.47
By Fellowship to U. G. C. Fellow		2,830.66	2,830.66
By Travelling Allowance			
By Governing Body & Selection Committee meeting	3,274.65	9,098.31	12,372.96
For attending meeting & Conference in India and for other purposes		9,912.99	9,912.99
By Maintenance of Property			
For Building		38,348.80	38,348.80
For Garden		5,902.60	5,902.72
For Equipment & Apparatus	8,092.60	—	8,092.60
For Vehicles	4,053.87	241.95	4,295.82
For Repairs & Renewals		20,914.91	20,914.91
For Petty Constructions		9,477.05	9,477.05

RECEIPTS	PLAN	NON-PLAN	TOTAL
Miscellaneous Receipt			
Recoveries		2,242.46	2,242.46
C. D. S. Receipts from R. P. F. commissioner, Kanpur	9,017.60	51,420.50	60,438.10
Application fees		645.00	645.00
Pension Contribution of Dr S. C. D. Sah		2,729.63	2,729.63
Leave Salary Contribution of Dr S. C. D. Sah		2,873.48	2,873.48
For Loans & Advances			
Recovery of Festival Advances		5,220.00	5,220.00
Recovery of Conveyance Advance		11,192.00	11,192.00
Interest on Conveyance Advance		217.61	217.61
To Deposit			
Security Deposits	50,586.60	—	50,586.60
To Miscellaneous Receipts on Capital Account			
C. Z. Company	6,402.40	—	6,402.40
Donation and Endowments			
Proceeds of Matured securities		1,500.00	1,500.00
Interest		277.50	277.50

PAYMENTS	PLAN	NON-PLAN	TOTAL
By Contingencies			
By Telephone & Trunk call charges		12,902.95	12,902.95
For Postage		11,250.00	11,250.00
For Advertisement	8,363.71	5,407.78	13,771.49
For Hot & Cold Weather charges		4,244.50	4,244.50
For Petrol & Mobil Oil	3,929.24	3,976.05	7,905.29
For Electricity charges	22,838.20	39,380.16	62,218.36
For Municipal Taxes		19,503.08	19,503.08
For Insurance of Vehicle and Library		1,056.45	1,056.45
For Liveries to Sub. staff	1,706.50	5,353.81	7,060.31
For Printing & Stationery	8,602.42	11,835.21	20,438.23
For Custom Duty & Port Trust Charges		263.60	263.60
For Rly. Ft. & Carriage		2,525.61	2,525.61
For entertainment Allow. to Director		1.745.71	1,745.71
For Misc. & Unforseen	7,665.42	8,264.29	15,929.71
For Glassware & Chemicals	22,267.24	75,057,52	97,324.76
For Library Requirements		19,951.15	19,951.15
For Museum Requirements	6,323.52	3,049.68	9,373.20
For Herbarium Requirements		973.10	973.10
For Legal Advice		257.60	257.60
For C. D. S. from R. P. F.			

RECEIPTS	PLAN	NON-PLAN	TOTAL
Total B/F	15,32,987.20	20,18,927.87	35,51,915.07
Grand Total Rs.	15,32,987.20	20,18,927.87	35,51,915.07

PAYMENTS	PLAN	NON-PLAN	TOTAL
Commissioner Kanpur	9,017.60	51,420.50	60,438.10
For Publications			
The Palaeobotanist		34,509.08	34,509.08
For catalogue		19,230.35	19,230.35
For Seward Memorial Lecture		781.00	781.00
For Annual Report		2,233.83	2,233.83
For Birbal Sahni Memorial Lecture		1,891.01	1,891.01
For Silver Jubilee Lecture		872.18	872.18
For Academic Expenses			
For Field Excursion	27,698.45	6,021.92	33,720.37
Birbal Sahni Memorial Lecture		350.00	350.00
Sir A. C. Seward Memorial Lecture out of Donation Account		350.00	350.00
For Training of Academic staff at G. S. I. Camp		143.47	143.47
By International Programmes			
Air Passage for members of staff proceeding on foreign fellowships or invited to attend Scientific meetings and conference Abroad		14,689.79	14,689.79
By IV International Palynological Conference	90,849.60	1,20,332.85	2,11,182.45
By G. P. F. Account			

RECEIPTS	PLAN	NON-PLAN	TOTAL
Total B/F	15,32,987.20	20,18,927.87	35,51,915.07
Grand Total Rs.	15,32,987.20	20,18,927.87	35,51,915.07

PAYMENTS	PLAN	NON-PLAN	TOTAL
G. P. F. Subs. transferred to G. P. F. Account	16,454.84	77,712.21	94,167.05
Recovery of Adv. & Interest thereon transferred to G. P. F. Account	9,796.00	42,780.00	52,576.00
By Miscellaneous			
Income tax remitted	9.216.00	20,923.00	30,139.00
Insurance Premium remitted	12,198.13	30,229.04	42,427.17
C. D. S. (Addl. D. A.) remitted	17,080.00	69,971.00	87,051.00
C. T. D. Amount remitted	970.00	4,370.00	5,340.00
Transferred of Silver Jubilee balance to C. R. Account		635.46	635.46
By Govt. of India Scholarships		5,400.00	5,400.00
By Loans and Advances			
Festival Advance		5,400.00	5,400.00
By Oil India Expenses		8,862.20	8,862.20
By Amount Transferred to C. R. Deposit Account	840.00	—	840.00
By Pension & Superannuation		15,918.00	15,918.00
By Refund out of Deposits			
To Modern Construction	7,762 18	—	7,762.18
To India Construction Co.	9,250.00	—	9,250.00

RECEIPTS	PLAN	NON-PLAN	TOTAL
Total B/F	15,32,987.20	20,18,927.87	35,51,915.07
Grand Total Rs.	15,32,987.20	20,18,927.87	35,51,915.07

BANK

	Recurring	Non-Recurring
PLAN	46,236.83	3,37,479.02
NON-PLAN		
Central Recurring	84,349.51	—
Oil India	745.58	—
Silver Jubilee	—	—
Donation & Endowment	6,482.73	—
	91,577.82	
Cash in hand	143.46	
	91,721.28	3,37,479.02

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

Sd/- S. C. Srivastava
Section Officer
A. G. II, U. P.

PAYMENTS	PLAN	NON-PLAN	TOTAL
To National Builders	9,250.00	—	9,250.00
To A. Rehman	9,250.00	—	9,250.00
To Gurcharan Singh	280.00	—	280.00
By Closing Balance	3,83,727.10	91,721.28	4,75,448.38
Grand Total Rs.	15,32,987.20	20,18,927.87	35,51,915.07

CLOSING BALANCE

CASH

Recurring	Non-Recurring
11.25	—
127.30	—
16.16	—
—	—
—	—
143.46	NIL

Sd/- A. K. Banerjee
Inspecting Officer
A. G. II, U. P.

Sd/- Gurcharan Singh
Registrar
Birbal Sahni Institute
of Palaeobotany

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

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