# ANNUAL REPORT

## 1980-81

BIRBAL SAHNI
INSTITUTE OF PALAEOBOTANY
LUCKNOW

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## INTRODUCTION

Palaeobotany deals with plants of the remote past. It is one of those disciplines which transgress two major sciences, viz., botany and geology. With the increasing emphasis on finding new reserves of fossil fuels—coal and oil—palaeobotany, particularly its subdiscipline palaeopalynology, is becoming increasingly important. With the farsight of a seer, Professor Birbal Sahni, F.R.S. envisaged the increasing importance of the study of fossil plants. As far back as 1929, he proposed to put the palaeobotanical research in the country on an organised basis. As official support was not readily forthcoming at that time, he decided to make a beginning with private resources.

On 3rd June, 1946, The Palaeobotanical Society was registered with the aim of promoting original research in palaeobotany. The Society was charged with the foundation of an Institute of Palaeobotany, which it did on 10th September, 1946. In the beginning the Institute was housed in the Botany Department of the Lucknow University and had as its nucleus the reference library and fossil collections of Professor Sahni.

In September 1948, the Government of Uttar Pradesh provided a plot of land for the Institute. Funds were also forthcoming from the Government of India. On 3rd April 1949, the then Prime Minister, Pandit Jawahar Lal Nehru laid the foundation stone of Institute's own building. Unfortunately, Professor Sahni did not live to see his work completed. He died just a week after the foundation stone laying ceremony. To commemorate his memory, the Palaeobotanical Society, in October 1949, renamed the Institute as Birbal Sahni Institute of Palaeobotany.

The Institute is devoted to promotion of higher study and research in fossil botany, both from academic and applied viewpoints and to the dissemination of knowledge so acquired. Research investigations at the Institute are carried out under a

number of projects, which are distributed among the following departments :

1. Precambrian Biology and Palaeozoic Palaeobotany,
2. Mesozoic Palaeobotany,
3. Cenozoic Palaeobotany,
4. Quaternary Palynology,
5. Oil Palynology,
6. Coal Palaeobotany, and
7. Geochronology Laboratory.

During the period under report, the Institute had a new Director—Dr. M. N. Bose—who took charge on 5th May, 1980. Soon thereafter a number of scientific posts lying vacant were filled up so that by the year-end the strength of the scientific staff went up to 64 and that of the associate staff to 102. A total of 54 research reports were published by the scientists of the Institute. One of the staff earned the degree of Doctor of Philosophy. A number of scientists are on national/international committees/ boards. Now the scientific officers also participate in the administration of the Institute through various committees.

Research on Precambrian sediments has yielded remains of primitive algae and other forms of life from the Vindhyan and Cuddapah supergroups of Madhya Pradesh and Karnataka respectively. The Permian coal-bearing and associated strata of Bihar and Orissa have shown the presence of a number of hitherto unknown pteridophytes. Ginkgoalean leaves have been discovered in the Middle Triassic strata of Madhya Pradesh. Two major programmes have been undertaken to review, reinvestigate, rewrite and reillustrate the Lower Cretaceous floras of India, and the Mesozoic floras of the Kachchh Basin. Well-preserved microplankton and nannoplankton, both indicative of a marine environment, have been recovered from the Jurassic-Cretaceous sediments of the Kachchh Basin. Similarly the discovery of Rhodophycean algae in the Deccan Intertrappean cherts of Madhya Pradesh provides evidence of marine conditions in that region. A large number of fungal spores have been recovered from grab and core samples from the Indian Ocean. Geological studies have shown

that the Bap Rann near Phalodi, Rajasthan was formed by the Process of deflation and represents a topographic depression in a nearly flat desertic country. The pollen profile from the Baramsar Rann, Rajasthan, reveals the former occurrence of grass-chenopod-savannah in this region. It has been found that by detailed coal typological and maturation studies, it is possible to correlate most of the coalseams in different coalfields. Four composite coal types have been recognised which show distinct geological, palaeobotanical, palynological and petrological characteristics. Nannoplankton recovered from Vridhachalam area depict the presence of standard Nannoplankton Zone NP9 which is sparnacian in age. Bore core no. 27 of Gujarat Directorate of Geology and Mining, earlier dated as Lower Eocene or Miocene, has now been palynologically dated as Middle-Upper Eocene. Fission-track technique has been used to date the last thermal episode in the Iron Ore Series.

## Governing Body

**Chairman**

Prof. T. S. Mahabale, F.N.A.,
Maharashtra Association for the Cultivation of Science,
Pune 411 004

**Members**

Shrimati Savitri Sahni,
686, Birbal Sahni Marg,
Lucknow 226 007

Secretary to the Government of India,
Department of Science & Technology,
Technology Bhavan, New Mehrauli Road,
New Delhi 110 029

Joint Secretary (Finance),
Department of Science & Technology,
Technology Bhavan, New Mehrauli Road,
New Delhi 110 029

Dr D. Lal, F.N.A., F.R.S.,
Director, Physical Research Laboratory,
Navrangpura,
Ahmedabad 380 009

Prof. B. G. Deshpande, F.N.A.,
Head of the Geology Department (Retd.),
University of Poona,
Pune 411 004

Director-General,
Geological Survey of India,
27, Jawaharlal Nehru Sarini,
Calcutta 700 013

Director-General,
Archaeological Survey of India,
New Delhi 110 011

Director,
Botanical Survey of India,
Botanic Gardens, Howrah 711 103

Prof. V. Puri, F.N.A.,
Professor Emeritus,
Department of Botany, Meerut University,
Meerut

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

Prof. B. S. Trivedi, F.N.A.,
Head, Botany Department,
Lucknow University, Lucknow 226 007

Prof. J. N. Rai,
Nominee of the Vice-Chancellor,
Lucknow University, Lucknow 226 007

**Secretary**

Director,
Birbal Sahni Institute of Palaeobotany,
Lucknow 226 007

**Assistant Secretary (Non-member)**

Registrar,
Birbal Sahni Institute of Palaeobotany,
Lucknow 226 007

## Honours and Awards

M. N. Bose .. Chairman, Session E, First International Palaeobotanical Conference, Reading, U.K.

R. N. Lakhanpal.. Co-Chairman of a symposium Session on topic 16, V International Palynological Conference, Cambridge, U.K.

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| Vishnu-Mittre | .. | Co-Chairman of a symposium session on topic 9F, V International Palynological Conference, Cambridge, U.K. |
| P. K. Maithy | .. | Co-Chairman, Session VII, XI Himalayan Geology Seminar, Dehradun. |
| B. N. Jana | .. | Awarded the degree of Doctor of Philosophy for his work on "Contribution to the Mesozoic Palaeobotany of India" by the Lucknow University. |

## Representation on Committees/Boards

| | | |
|---|---|---|
| Anand-Prakash | .. | Treasurer, Indian Association of Palynostratigraphers. |
| N. Awasthi | .. | Editor, Geophytology. |
| D. C. Bharadwaj | .. | President, Indian Association of Palynostratigraphers. |
| | .. | Member, National Indian Committee for I.G.C.P. |
| | .. | Member, Scientific Committee, I.G.C.P. (UNESCO & IUGS). |
| | .. | Member, Editorial Board, Review of Palaeobotany and Palynology. |
| | .. | Editor, The Palaeobotanist. |
| | .. | Chief Editor, Biological Memoirs. |
| | .. | Chief Editor, Proceedings of IV International Palynological Conference. |
| | .. | Secretary, The Palaeobotanical Society. |
| M. N. Bose | .. | Member, Scientific Advisory Committee for Geo-sciences relating to Oil Exploration and Production, Ministry of Petroleum, Chemicals & Fertilizers. |

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| | .. | Member, Research Advisory Committee of the Wadia Institute of Himalayan Geology. |
| | .. | Chairman, Editorial Board, The Palaeobotanist. |
| | .. | Member, Executive Committee, The Palaeobotanical Society. |
| | .. | Member, National Working Group for IGCP-Project no. 4. |
| | .. | Member, National Working Group for IGCP-Project no. 106. |
| | .. | Participant, IGCP—Project no. 145. |
| | .. | Vice-President, Reception Committee, 46th Annual Meeting of the Indian Academy of Sciences. |
| | .. | Vice-President, Organising Committee, 3rd All India Botanical Conference. |
| | .. | Vice-President, Organising Committee, 5th National Symposium on Cryogenics, Lucknow. |
| H. P. Gupta | .. | Business Manager, Indian Association of Palynostratigraphers. |
| K. P. Jain | .. | Secretary, Indian Association of Palynostratigraphers. |
| | .. | Joint Secretary, Palaeontological Society of India. |
| R. K. Kar | .. | Joint Secretary, The Palaeobotanical Society (till December, 1980). |
| H. A. Khan | .. | Secretary, Palynological Society of India. |
| R. N. Lakhanpal | .. | Chief Editor, The Palaeobotanist. |
| | .. | Member, Sectional Committee for Botany, Indian National Science Academy. |
| | .. | Member, Executive Committee, International Association for Angiosperm Palaeobotany. |

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| H. K. Maheshwari | .. | Member, Committee for Fossil Plants, International Association for Plant Taxonomy. |
| | .. | Editor, The Palaeobotanist. |
| | .. | Editor, Indian Association of Palynostratigraphers. |
| | .. | Member, Editorial Board, Proceedings of the IV International Palynological Conference. |
| P. K. Maithy | .. | Member, International Working Group on Precambrian Biostratigraphy. |
| | .. | Member, National Working Group, IGCP - 29, Pre-Cambrian-Cambrian Boundary. |
| G. K. B. Navale | .. | Member, International Committee of Coal Petrology. |
| | .. | Member, International Gondwana Coal Committee, IGCP. |
| | .. | Member, International Commission on Coal and Lignite Nomenclature and Analysis. |
| | .. | Member, IGCP-Project Global Correlation of Coal bearing formations. |
| | .. | Joint Secretary, Organising Committee of Indian Coal Petrology. |
| | .. | Joint Secretary, The Palaeobotanical Society. |
| | .. | Member, Editorial Board, Coal Geology. |
| U. Prakash | .. | Regional Representative for India, International Association for Angiosperm Palaeobotany. |
| G. Rajagopalan | .. | Member, Organising Committee, 5th National Symposium on Cryogenics, Lucknow. |

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|---|---|---|
| H. P. Singh | .. | Member, Executive Committee, The Palaeobotanical Society (w.e.f. Dec., 1980). |
| J. Singh | .. | Member, Editorial Board, Proceedings of the IV International Palynological Conference. |
| J. C. Srivastava | .. | Assistant Editor, Indian Journal of Museums. |
| Shyam C. Srivastava | .. | Member Executive Committee, The Palaeobotanical Society. |
| Suresh C. Srivastava | .. | Editor, Geophytology. |
| R. S. Tiwari | .. | Member, Editorial Board, Proceedings of the IV International Palynological Conference. |
| | .. | Member, IGCP Project-Triassic Studies. |
| | .. | Chief Editor, Geophytology. |
| | .. | Editor, Biological Memoirs. |
| Vishnu-Mittre | .. | Member, Central Advisory Board of Archaeology. |
| | .. | Member, Co-ordination Committee for Quaternary Research in western India. |
| | .. | Member, Committee to organise the National Museum of Man, Ministry of Education & Social Welfare. |
| | .. | Member, Subsector Allergy & Applied Immunology, U. P. Council of Science & Technology. |
| | .. | Member, Committee of Research Studies, Burdwan University. |
| | .. | Member, Executive Council, Indian Aerobiological Society. |
| | .. | Convener Member of the Commission to report on French Institute, Pondicherry as a Centre for Ph.D. affiliation. |

# Research

## DEPARTMENT OF PRECAMBRIAN BIOLOGY AND PALAEOZOIC PALAEOBOTANY

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

*Objective* : *To study the biota and organo-sedimentary structures from Proterozoic rocks and their significance in biostratigraphy*

*Subproject* : *Microbiota and organo-sedimentary structures from Vindhyan Supergroup, Madhya Pradesh*

Completed the study of organo-sedimentary structures and biota from Semri, Rewa and Bhander groups and their distribution in the area. Identified *Biocatenoides, Huronispora, Sphaerophycus, Corymbococcus, Aphanocapsiopsis, Orygmatosphaeridium, Bavlinella, Polyedryxium, Granomarginata, Exochobrachium* and stromatolite—*Conophyton.*

Five types of problematic remains of unknown affinity have been recovered from Suket Shale Formation, Ramapura (M. P.). Their study under incident light has been completed.

P. K. Maithy and Manoj Shukla

*Subproject* : *Microbiota and organo-sedimentary structures from Cuddapah Supergroup*

The Study of microbiota and organo-sedimentary structures from Varikunta has been completed. Four types of acritarch and organo-sedimentary structure (Catagraphs) are identified.

J. Mandal and P. K. Maithy

*Project* : *Resolution of Gymnosperms and Pteridophytes in Glossopteris Flora*

*Objective* : *To study the morphology of different elements in the Glossopteris Flora and their stratigraphical significance*

*Subproject* : *Pteridophytes from Barakar Formation, Churulia area, Bihar*

Specimens of *Neomariopteris hughesi*, *Trizygia speciosa* and *Sphenophyllum* were studied. A new species, *S. churulianum* has been instituted. On the basis of evidence obtained from new specimens a new reconstruction is given for *Gondwanophyton*. Results of investigation are being synthesized.

A. K. Srivastava

*Subproject : Kamthi Formation, Handappa, Orissa*

The study of Lycopodiales, Equisetales, Sphenophyllales, Filicales and cycads has been completed and two papers on the same are being finalized. A new significant fern genus *Pantopteris* has been instituted. Rare plants like *Cyclodendron*, *Pseudoctenis* and *Lelstotheca* have also been described.

Shaila Chandra

*Subproject : Lower Gondwana formatoins of Pachwara Coalfield, Rajmahal Hills, Bihar*

Plant megafossils from Tattitola area were studied. Eleven species of *Glossopteris* and one species each of *Phyllotheca*, *Schizoneura*, *Neomariopteris* and *Dichotomopteris* were identified. Miospores from Bargo and Alubera areas were also studied.

Bijai Prasad

*Project : Morphotaxonomy and Palynostratigraphy of Lower Gondwana spores*

*Object : To study in detail the morphology of Lower Gondwana spores and their importance in biostratigraphy*

*Subproject : Lower Gondwana formations of Hutar Coalfield, Bihar*

A paper on the Talchir palynomorphs from the Hutar Coalfield was completed and submitted for publication. The assemblage is dominated by radial monosaccate pollen, such as *Parasaccites* and *Plicatipollenites*. Palynological analysis of Karharbari Formation has also been completed. The assemblage shows overall dominance of the genera *Parasaccites* and *Callumispora* in the older beds and *Parasaccites* and *Scheuringipollenites* in the younger ones.

The results of biometric study of *Plicatipollenites* and *Potonieisporites* from Hutar Coalfield show agreement with similar work done earlier by Lele and Shukla (1978) from other basins.

K. M. Lele and Manoj Shukla

## DEPARTMENT OF MESOZOIC PALAEOBOTANY

*Project* : *Middle-Upper Triassic floras of India*

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

Ginkgoalean leaves from the Triassic of Nidpur have been assigned to *Sidhiphyllites flabellatus* gen. et sp. nov. Though, morphologically the leaves are like *Ginkgoites*, in cuticular structure they are quite distinct. The paper has been submitted for publication. Text-figures of 90 specimens of seeds have been drawn, about 30 of them have also been photographed. A fertile polleniferous shoot has also been photographed.

Shyam C. Srivastava

Descriptions, text-figures and photography of pteridophytes (jointed stems with ridges and grooves and equisetaceous leaf-sheath), 2 new species of *Lepidopteris* and 4 species (2 new) of *Elatocladus* from the Tiki Formation have been almost completed. Cuticular preparations, photographs and text-figures of *Dicroidium* leaves have been made ; description is being completed. A large number of leaves, a few megaspores and fructifications have been recovered by bulk maceration of the shale.

P. K. Pal and Shyam C. Srivastava

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

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

From the Jurassic of Rajmahal Hills, photographs, text-figures and draft descriptions of *Hepaticites* sp. and *Equisetum rajmahalense* have been prepared. Work on *Lycopodites gracilis* and *Lycoxylon indicum* has been started.

M. N. Bose and P. K. Pal

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

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

A paper on the occurrence of the genus *Ctenozamites* in the Jabalpur Formation has been sent for publication. It deals with a new species of the genus which is based on gross features of a large number of specimens.

The description and text-figures of a new species of *Equisetum* from Sehora are being finalized.

Some fossil gymnosperms from Sehora have been photographed. A few cuticular slides have been prepared.

Sukh-Dev, Zeba-Bano and R. S. Singh

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

*Objective* : *To carry out morphological and cuticular studies*

A manuscript on a new species of *Allocladus* from Bansa has been completed. Work on specimens resembling *Ctenis imjhiriensis* in form and venation pattern, was undertaken. Draft description of morphological and cuticular features has been written.

Sukh-Dev

Description of a new fern species from Tarnetar and some species of *Ptilophyllum* and *Brachyphyllum* from Bansa have been completed. Some text-figures of ferns have also been drawn. Some specimens of ferns, *Brachyphyllum* and *Araucarites*, from Tarnetar have been photographed.

M. N. Bose, Sukh-Dev and Rashmi Srivastava

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

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

Draft descriptions of *Thallites* sp., *Isoetites indicus*, *I. serratifolius*, *Equisetum rajmahalense*, *? Gleichenites* sp., *Hausmannia dichotoma*, *Matonidium* sp., *Cladophlebis deradensis*, *C.* sp. cf. *C. kathiawarensis* and *C.* spp. have been completed along with text-figures. Investigations on *Coniopteris*, *Pachypteris* and *Linguifolium* were also undertaken.

M. N. Bose and Jayasri Banerji

A paper '*Phlebopteris minutifolius* sp. nov. from Kutch' has been sent for publication. Both sterile and fertile leaves have been described. The sori have yielded trilete spores having laevigate exine. Preliminary identification, descriptions and text-figures of *Cladophlebis* spp., *Pachypteris holdenii*, *Ptilophyllum* sp., *? Taeniopteris* sp. cf. *T. kutchensis* and *Brachyphyllum suryanarayanii* from the Khari River have been completed.

Jayasri Banerji

Palynomorphs from Pipli, Kathiawar have been photographed and described. The assemblage contains the genera *Cyathidites*, *Dictyophyllidites*, *Foveotriletes*, *Matonisporites*, *Ischyosporites*, *Callialasporites*, *Podocarpidites* and *Araucariacites*. The genus *Dictyophyllidites* is the dominating form in the assemblage.

B. N. Jana

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

*Objective* : *To study morphotaxonomy of the palynomorphs and their application in the stratigraphy of the basin*

A large number of samples from many localities in the Kachchh mainland, mostly in the Jhuran and Bhuj formations, have proved palynologically productive. The recovered palynomorphs include miospores, dinoflagellate cysts, nannofossils and fungal

bodies. Important dinocyst genera noticed are *Laptodinium, Chytroeisphaeridia, Sentusidinium, Pareodinia, Gonyaulacysta* and *Oligosphaeridium*. Nannofossils which could be identified are *Cyclogelosphaera margerli, Ellipsogelosphaera brittanica* and *E. communis*.

A number of samples from the Washtawa Formation and Wagad Sandstone in eastern Kachchh were processed but all proved to be palynologically barren.

A large number of megaspores have been isolated from rock samples from Walkamota, Sukhpar, Kera and some other localities in Kachchh for their morphotaxonomical studies. Some of the important genera are *Paxillitriletes, Dijkstraesporites, Minerisporites* and *Erlansonisporites*.

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

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

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

Photographs, text-figures and manuscript on a fossil conifer from Vemavaram beds have nearly been finalized. It deals with a sterile twig of the genus *Elatocladus* which bears bifacial, spirally arranged small leaves.

Sukh-Dev and V. B. Srivastava

Epidermal preparations have been made from two specimens of *Ptilophyllum* from the Cauvery Basin. Epidermal features of *Thinnfeldia, Elatocladus* and *Ptilophyllum* have been photographed. On the basis of epidermal features, the taxonomic status of the genus *Thinnfeldia* vis-a-vis the genera *Dicroidium* and *Pachypteris* is being worked out.

H. K. Maheshwari

**General**

The following review papers have been written and sent for publication.

"Mesozoic plant fossils from the Himalayas—A critique"

H. K. Maheshwari

"Pteridophytes from the Mesozoic, Tertiary and Quaternary deposits of India"

B. S. Trivedi and Sukh-Dev

**Mesozoic from Abroad**

A number of Jurassic-Cretaceous samples from Zaire, received from Museé Royale de l Afrique Centrale, Tervuren, Belgium have been processed for the study of palynomorphs.

H. K. Maheshwari

## DEPARTMENT OF CENOZOIC PALAEOBOTANY

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

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

Palynological studies were carried out on the Neogene core samples of Bengal Fan. These yielded a good assemblage of miospore genera *Cyathidites, Todisporites, Osmundacidites, Leptolepidites, Laevigatosporites, Lycopodiumsporites, Striatriletes, Pinuspollenites, Palmaepollenites, Podocarpidites*, etc. The fungal genera recovered are *Inapertisporites, Phragmothyrites, Notothyrites, Pleuricellaesporites, Dicellaesporites*, etc.

Anil Chandra

A paper on the fungal spores recovered from 45 samples from 5 cores collected by R/V Oceanographer of the National Institute of Oceanography, Goa was submitted for publication. This study showed a rich assemblage of fungal spores belonging to various species of *Inapertisporites, Dicellaesporites, Multicellaesporites, Staphlosporonites, Pleuricellaesporites, Lacrimasporites*, etc.

Anil Chandra and R. K. Saxena

A paper on the fungal spores, recovered from 35 grab samples collected by Cruise II of R. V. Gaveshani of the National Institute

of Oceanography, Goa, along the western coast of India, near Bombay and the Gulf of Kachchh was submitted for publication. It has been observed that the diversity of the fungal spores decreases with the increase in distance from the coast (off shore) and it is high at the mouth than at the head of the Gulf of Kachchh. Studies on pollen/spores recovered from 13 grab samples from the Gulf of Kachchh were also carried out.

Anil Chandra and R. R. Yadav

Palynological studies were further carried out on 200 grab samples collected from the western coast of India by Cruise 17 and 18 of R/V Gaveshani, and about 50 genera of pollen grains were identified. The assemblage showed a dominance of pollen grains from mangrove plants which are represented by *Rhizophora*, *Bruguiera*, *Ceriops* (Rhizophoraceae), *Avicennia* (Avicenniaceae), *Sonneratia* (Sonneratiaceae), *Excoecaria* (Euphorbiaceae) and those of Chenopodiaceae. The pollen grains of tropical rain forest are represented by *Salmalia* (Bombacaceae), *Celtis*, *Holoptelea* (Urticaceae), *Acacia* (Leguminosae), *Terminalia* (Combretaceae) and those of Myrtaceae, Sapotaceae and Palmae. Pollen grains of *Pinus* and *Picea/Abies* are also represented but the frequency is very low. Pteridophytic spores are fairly represented in the samples from near the coast.

Anil Chandra and R. R. Yadav

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

*Objective* : *To explore new exposures of the Deccan Intertrappean Series and study the plant fossils in detail which would give a clear picture of the Early Tertiary vegetation and climate of the Deccan Trap country*

A large number of charophytic gyrogonites obtained from the clay samples from Rajahmundry were further examined and about 55 well-preserved specimens sorted out for a detailed study.

M. B. Bande

Two Rhodophycean algal fossils, *Peyssonnelia antiqua* Johnson and *Distichoplax* Pia were identified and described from Mohgaon

Kalan cherts and a detailed paper submitted to press. The occurrence of *Distichoplax* indicated Palaeocene-Eocene age for the Intertrappean beds of Mohgaon Kalan in Chhindwara District, while *Peyssonnelia* provided evidence of marine conditions in that region.

U. Prakash and M. B. Bande

Work on the monocotyledonous inflorescence collected from Mohgaon Kalan beds was completed and its affinities traced to the families Palmae and Liliaceae. A paper has been submitted for publication describing this inflorescence which has been named as *Monocotylostrolous bracteatus* gen. et sp. nov.

R. N. Lakhanpal, U. Prakash and M. B. Bande

A paper was submitted for publication on a number of well-preserved fossil palm woods and fruits collected from near Shahpura in Mandla District of Madhya Pradesh. The affinities of the palm fruit were traced to *Hyphaene* alliance of the Borassoid Group of palms. In addition to this a detailed paper on a petrified palm wood resembling the modern palm *Chrysalidocarpus* was also finalized and submitted for publication. Another new species of *Palmoxylon* was also studied from the same beds and a manuscript prepared.

U. Prakash, M. B. Bande and Krishna Ambwani

Fossil dicot woods collected from Nawargaon in Wardha District of Maharashtra were sectioned and studied in detail. Out of these, six new types were photographed, described and tentatively assigned to the families Tiliaceae, Meliaceae, Bignoniaceae, etc.

M. B. Bande

A paper on a petrified root wood resembling *Borassus* was finalized from Nawargaon. Five samples from the Deccan Intertrappean beds of Worli, Bombay were macerated but proved barren of fossils.

Krishna Ambwani

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

*Objective* : *To build up a floristic succession which would help in throwing light on the palaeoenvironments and the plant migrations in western India*

About 15 fossil woods collected from near Jaisalmer were studied. Some of these were also photographed. One of the woods beolngs to gymnosperms, while the rest are angiospermous.

Identification of fossil woods from the Pliocene of Dhaneti and Mothala, Kachchh, resembling *Albizia*, *Cynometra*, *Dialium*, *Millettia* (Leguminosae), *Dipterocarpus* (Dipterocarpaceae), *Sterculia* (Sterculiaceae) and *Terminalia* (Combretaceae) was confirmed with their modern equivalents. Some more woods were also cut and studied.

J. S. Guleria

Four fossil woods from the Miocene beds of Chorar Island, Banaskantha District, were studied. One of them has been tentatively identified with the woods of Anacardiaceae.

Sixty palynological samples from Fuller's Earth bed near Kolayat in Rajasthan were macerated but found barren. Fifty lignite samples from Palana in Rajasthan were also macerated and their slides were prepared.

Krishna Ambwani

A paper describing eleven species of leaf-impressions, fruits and seeds from Khari Series of Kachchh was finalized and submitted for publication. These include leaf-impressions of *Bauhinia*, *Cassia*, *Millettia*, *Leguminophyllum*, *Murraya*, *Cinnamomum*, *Ficus* and *Palmacites*, fruits of *Leguminocarpon* and seeds assigned to *Leguminosites*. The assemblage suggests a moist to dry deciduous vegetation around Goyela-Mokra during the Lower Miocene of Kachchh.

R. N. Lakhanpal and J. S. Guleria

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

*Objective* : *Critical studies on the fossil woods and other plant remains from the Neogene of South India to be carried out to unravel*

*the vegetational complexes of this region during the Upper Tertiary. This would reveal the palaeo-ecology and phyto-geography of the past vegetation.*

Identification of some carbonized woods from Neyveli was further confirmed with the modern species of *Gluta-Melanorrhoea*, *Cordia* and *Diospyros*. Their photography and description were completed.

Identification of two carbonized woods from Varkala with *Swintonia* of Anacardiaceae and *Diospyros* of Ebenaceae respectively was confirmed. In addition, some more pieces of carbonized woods were sectioned and studied. One of them shows close resemblance with the wood of Lauraceae which is being reported for the first time from the Tertiary rocks of South India.

Nilambar Awasthi

Ten lignite samples from Neyveli were macerated and a good assemblage of pollen and spores was obtained. A paper describing the fungal remains from this assemblgae was prepared and submitted for publication. This includes *Dicellaesporites*, *Parmathyrites*, *Staphlosporonites*, *Multicellaesporites* and representatives of the families Myxomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes. In addition, 400 microtome sections of the lignite were also prepared to study the plant remains.

Krishna Ambwani

*Project* : *Studies on the plant fossils from the Himalayan foot-hills*
*Objective* : *To build up a floristic succession of the Siwalik Group*

Identification of six fossil dicotyledonous woods from the Lower Siwalik beds of Himachal Pradesh was confirmed with those of *Adenanthera*, *Acrocarpus*, *Ormosia* and *Koompassia* of Leguminosae and *Aglaia* of Meliaceae and a manuscript prepared.

U. Prakash and R. R. Yadav

Four fossil woods from the Siwalik beds of Kalagarh were identified with Palmae, Dipterocarpaceae (*Dipterocarpus*, *Anisoptera*) and Sapotaceae-Lecythidaceae.

U. Prakash

Ten leaf-impressions from the Siwalik beds of Bikhnathoree, Bihar were identified with the modern leaves of *Kydia calcina* (Malvaceae), *Amoora rohituka*, *Toona ciliate* (Meliaceae), *Cassia glauca*, *Pongamia glabra*, *Millettia brandisiana*, *Pterocarpus macrocarpus* (Leguminosae), *Ardesia* sp. (Myrsinaceae), *Machilus odoratissima* (Lauraceae) and *Ipomea eriocarpa* (Convolvulaceae).

R. N. Lakhanpal and Nilambar Awasthi

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

*Objective* : *Although a fairly good picture of the Neogene vegetation has emerged from our studies on fossil woods from the Tipam and Dupitila Series, it is proposed to extend this study also to the Palaeogene megafossils of this region so as to build up Tertiary vegetation of northeastern India.*

Description of twenty one fossil woods from the Tipam Sandstones of Assam and Nagaland was revised and finalised. A thesis entitled, "Middle Tertiary Flora of northeastern India" was submitted. This included fossil woods comparable to *Calophyllum*, *Dipterocarpus*, *Hopea*, *Shorea*, *Gymnosporia*, *Schleichera*, *Gluta-Melanorrhoea*, *Mungifera*, *Albizia*, *Cassia*, *Dialium*, *Sindora*, *Barringtonia*, *Lagerstroemia*, *Phyllanthus* and *Artocarpus*. Modern woods of *Mangifera longipes*, *Phyllanthus emblica*, *Melanorrhoea torquata* and *Artocarpus chaplosa* were also photographed.

Thin sections of about seventeen fossil woods from Assam and Nagaland were further cut and studied. These belong to Leguminosae, Dipterocarpaceae (*Dipterocarpus*) and Lythraceae (*Lagerstroemia*).

V. Lalitha

Fossil woods from Namsang beds of Deomali in Arunachal Pradesh resembling *Sterculia* (Sterculiaceae), *Canarium* (Burseraceae), *Euphorbia* (Sapindaceae), *Madhuca* (Sapotaceae), *Bischofia* (Euphorbiaceae), *Albizia*, *Bauhinia*, *Kingiodendron*, *Sindora-Copaifera* (Leguminosae) and woods of Lauraceae were identified, photographed and described.

U. Prakash and Nilambar Awasthi

Final identification of fossil woods from Subansiri and Siang districts of Arunachal Pradesh was done. These woods belong to modern dicot taxa *Shorea*, *Euphoria*, *Albizia*, *Cynometra*, *Cassia*, *Melanorrhoea* and *Terminalia*.

Nilambar Awasthi

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

*Objective* : *Leaf-impressions and other plant megafossils to be worked out from new Karewa localities to present a clear picture of this flora and the climatic changes during this period*

Six type of leaf-impressions from the Lower Karewa beds of Hirpur were studied and photographed. Four of them were described in detail and identified with the mdoern leaves of *Potamogetone* (Potamogetonaceae), *Rosa* (Rosaceae), *Salix* (Salicaceae) and *Viburnum* (Caprifoliaceae).

A lignitized wood from the Lower Karewa beds near Hirpur was also studied, photographed and identified with the modern wood of *Cephalotaxus*. The presence of *Cephalotaxus* in Lower Karewas of Kashmir is phytogeographically very significant as it presently grows only in eastern Himalayas.

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

## DEPARTMENT OF QUATERNARY PALYNOLOGY

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

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

Pollen description and phytogeographical details of about 700 species of dicotyledons from western Himalaya have been completed. Relevant reference cards concerning bibliography for about 300 species have also been prepared.

A detailed light and scanning electron microscope study of modern and fossil pollen of *Larix* has been carried out. A paper

entitled 'The past and present distribution of *Larix griffithiana* Hort ex Carr. in the Indian Subcontinent as evidenced by palynology' was prepared and submitted for publication.

H. P. Gupta and Chhaya Sharma

Pollen morphological studies of 64 species of wild grasses have been completed and a manuscript on 'Further contributionto the palynology of cereal vs. non-cereal grasses in South Asia : Large-sized pollen in wild grasses' was prepared. The study reveals, as reported earlier, that pollen grains above 50 $\mu$m are produced by wild species of *Coix*, *Saccharum*, *Sorghum*, *Ischaemum* and *Themeda*.

Vishnu-Mittre and Aruna Sharma

Morphological studies of seeds of 148 wild and 30 cultivated species have been completed together with the data on their distribution, climatic requirements and uses made of by the tribals. The taxa studied belong to more than 47 natural orders. The data have been entered in index cards on which the line drawings are also entered and on seventeen cases the photographs have also been given.

Chanchala

Detailed studies have been carried out on seeds of modern wild and cultivated species of *Eleusine* from authentic materials collected from various parts of the country, Sudan, Uganda, Ethiopia and Africa and obtained through Professor M. S. Cheenaveeriah. Studies based upon 50-100 grains in each species have revealed shape and size classes to vary from one to three.

Vishnu-Mittre and Aruna Sharma

*Project* : *Pollen zonation scheme for western Himalaya, Rajasthan and Nilgiris*

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

The pollen analytical work hitherto carried out in these botanical distinct regions has been considered to determine events of simultaneous change in patterns of vegetation. Some events

dated by radiocarbon have been found. More or less similar changes in pattern vegetation on the same dates have been observed in other parts of the world. And these are believed to be of world-wide climatic fluctuations. A manuscript is under preparation.

Vishnu-Mittre

A paper critically reviewing the Quaternary palynostratigraphy was submitted for publication.

H. P. Gupta and Chhaya Sharma

Hitherto carried out work on the pollen analytical and palaeobotanical investigations in the Himalaya has been critically reviewed in a paper under the title 'Quaternary palaeobotany/palynology in the Himalaya—An over review' and sent for publication. The review brings out that the climatic requirements of the Early Pleistocene taxa were different from their modern counterparts ; that there is more of eastern Himalayan element in the early Pleistocene floristics than has been realised ; that the micro- and macrofossils studies are complementary ; that no direct or indirect evidence for parmaforst has been observed in sediments or in pollen content of the so-far-investigated Early Pleistocene sediments suggesting that these sediments belong to non-glacial Pleistocene and this comprised of cool (dry) and warm (moist) oscillations ; that the evolution and development of alpine and the full glacial alpine steppe took place during the glacial Pleistocene ; that the stratigraphy of the Lower Karewas needs a sustained and detailed reinvestigation to raise it from the present state of flux. The review also suggests the recognition and naming of type sites in keeping with the present practice in Quaternary. The review also refers to two dated warm fluctuations (about 2,900-3,100 and between 2,000-15,000 years ago) during the last glaciation with indications of deglaciation at or around 20,000 years ago. Instances of interaction of early man and his grazing animals, selective use of forest trees, importance of pollen/vegetation relationships, precision and exactitude in identification are the other aspects dealt with in the review.

Vishnu-Mittre

Four modern surface samples from Ladakh and 13 surface and moss cushions from the northern moist aspect of Rohtang pass

from sites located between 7,000 to 15,000 ft have been analysed to build up pollen/vegetation relationships to interpret fossil pollen spectra.

Twenty-five out of 36 samples of 52 m deep bore core (TSDI) from Tsokar Lake have been found polleniferous. This profile at 7.90 m depth is dated to 34,165±3370 radio-carbon years. Pollen analysis of the profile reveals long intervals of steppe vegetation dominated by chenopods. The sample at 47 m depth shows high values of Juniper pollen along with the alpine steppe elements.

Vishnu-Mittre and A. Bhattacharya

A manuscript entitled 'vegetation and climate during last glaciation in Ladakh' was prepared. The paper describes fluctuating events in pollen frequencies of Juniper in otherwise steppe vegetation as observed in pollen profile from Tsokar Lake, Ladakh and dating from before 32,000 to 11,000 radiocarbon years.

Vishnu-Mittre, A. Bhattacharya and B. S. Rawat

Pollen analysis of a profile from Parasram Tal, district Sirmur was completed and a pollen diagram of the taxa recovered from sediments was constructed. About 5 m deep profile is dated to 3,140±100 radiocarbon years. The study reveals the dominance of mixed oak conifer forests in the lower half of the diagram. Thereafter non-arboreals start increasing at about 2700 years B. P. and become dominant at about 900 years B. P. Occurrence of *Larix* in the profile is quite interesting. Its pollen is encountered right at the base of the pollen diagram and continue till 2 m depth dated to about 1,800 years B.P. (date extrapolated).

Chhaya Sharma

One soil profile from Sat Tal, district Nainital has been pollen analysed. A pollen diagram showing frequency chart for various taxa recovered from the sediments has been constructed. Five samples from 4.15 m deep profile have been dated by C14 method. The pollen diagram records the preponderance of pine pollen throughout except for minor fluctuations. The occurrence of *Larix* right at the beginning of the profile and its gradual disappearance in the middle of the profile between 1,500 to 1,000 years in the significant feature.

H. P. Gupta

Twenty modern surface samples collected from the tropical *Euphorbia* scrub near Jodhpur, dry deciduous *Anogeissus* forest near Ajmer and *Acacia-Capparis* community near Jodhpur and halophytic scrub from near Jaisalmer have been pollen analysed to build up pollen/vegetation relationships.

The recently constructed undated pollen diagram from about 2.40 m compact grey clay overlain by greenish sand from the Pokaran Rann shows dominance of grass-sedge savannah with fluctuating values of *Calligonum polygonoides, Prosopis cineraria, Salvadora* sp., *Ephedra* and *Artemisia.*

The partially complete pollen profile from the Baramsar Rann, a shallow saline depression in the Jaisalmer-Ramgarh area, reveals the former occurrence of grass-chenopod savannah in this region. In some samples an algal remain comparable with *Concentricystes rubinus* has also been observed.

Vishnu-Mittre and A. K. Saxena

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

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

The work on pollen analysis of profiles, and on modern pollen/vegetation relationships, from the Kathmandu Valley completed earlier, was looked into with the object of writing the text. A pollen diagram from Sankhu was reconstructed on the pattern other two diagrams had been constructed. The text of the paper has been completed. The work reveals that the oak-pine woods that occurred in the valley prior to 40,000 radiocarbon years succumbed subsequently to the cold and dry climate and the grasslands had expanded. Around 25,000 years the oakwoods had expanded again for a brief interval followed by grass steppe till 17,500 years ago. Their expansion occurred again after this period of time together with that of the grasslands but eventually the oaks declined. No evidence has been found in modern and fossil pollen spectra of the former occurrence of *Schima* or *Schima-Castanopsis* forest in the valley. Pine believed to be introduced

in the valley has been found to have been present during the last glaciation.

Vishnu-Mittre and Chhaya Sharma

*Project* : *History of Silent Valley forests*

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

Three samples of a 40 cm deep profile have been received from Dr Janel of French Institute and are under examination.

Study of pollen slides of about 50 plant species distributed in the Silent Valley and the other South Indian Tropical forests has been undertaken.

Vishnu-Mittre

*Project* : *History of ancient plant economy of India*

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

Lemma and palea of 64 wild species of grasses were examined but found to be different from those of wild and cultivated rices.

*Diamabad plant remains*—Carbonised grains in 14 samples from Diamabad, district Ahmednagar and belonging to the Savalda, Malwa and Jorwe cultures and ranging in age from 3,600—3,000 radiocarbon years were examined and segregated.

From the Savalda phase the fragmentary leaf impressions on clayed lumps are the only plant remains. The remains of food plants occur in samples from Malwa and Jorwe phase. The latter are comparatively richer in the kinds and number of grains. Following taxa have been identified : *Triticum* sp., *Hordeum* sp., *Eleusine coracana*, *Setaria* sp., *Paspalum scrobiculatum*, *Dolichos biflorus*, *Dolichos lab lab*, *Phaseolus* sp., *Vigna* sp., and *Zizyphus nummularia*. There are quite a few wild seeds also in the samples among which those of *Pavonia*, *Rhynchosia*, and of Centrospermae have been recognized. Some of them have been photographed also. Detailed studies of the carbonised grains referred to *Eleusine* have allowed segregation into three shape and size classes.

Vishnu-Mittre and Aruna Sharma

*Project* : *Studies on ethnobotany among the Indian tribes—drought-prone areas*

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

Data on the names and kinds of tribes and their distribution in the country and their primitive and ethnic status have been gathered from literature. Data have also been collected on the methods of agriculture, crops raised, food habits and use of wild plant life by them to meet several of their requirements. The data reveal a range in their socio-economy and subsistence pattern from forest dweller's food gathering and hunting stage to temporary and permanent settlements and most of them are engaged in shifting cultivation. In the drought prone areas particularly Gujarat, Rajasthan and Madhya Pradesh, etc. there are several common tribes. Minor millets are the major crops preferred by them and primitive methods are employed in their cultivation. Rice is a later entrant in their crops. Their subsistence derives much from several wild plants, detailed lists of which are under preparation.

Vishnu-Mittre and Chanchala

*Project* : *Studies in geomorphology of the Kashmir Valley and Rajasthan*

*Objective* : *To study the origin and geomorphic evolution of landforms, etc. in Rajasthan*

A paper dealing with the geomorphic evolution of Bap rann, Phalodi, Rajasthan was finalized for publication. It is suggested that the rann was probably formed by the process of deflation and represents an earlier base level of erosion, i.e. a topographic depression in a nearly flat desertic country. The nature of rann sediments indicates fluviolacustrine conditions.

A study of aerial photographs from Budha Puskar area, Ajmer has shown the presence of various important geomorphic features, like drainage channels, sand dunes, nature of the valley,

slopes and lakes, etc. These features were checked and further studied in the field. In general the study indicates that the fluvial geomorphic cycle in the area has been interrupted by the arid cycle resulting into the formation of sand dunes across the valley. Therefore, a number of lakes were developed mainly due to the obstruction in the run-off of the streams.

The study of aerial photographs from Pokaran area has indicated the presence of desert plains (erosional surfaces/pediments), some prominent drainage channels, dry lake beds, etc. The gulied margins of these plains indicate a possible rejuvenation of the area.

Anand-Prakash

## DEPARTMENT OF COAL PALAEOBOTANY

*Project* : *Palynostratigraphy of Indian coal deposits*

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

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

Samples from Khudia Nala (KDO series) and Jamunia River (JMR series) have been taken up for percentage determination. Twenty out of 36 samples from Karijhor Nala and 57 out of 92 bore-hole samples (MB-11) from Madhuban area yielded spores. Due to poor recovery of miospores maceration was repeated to get better results. Twenty-six samples have been counted. The samples studies so far show the dominance of striated-disaccate grains, viz., *Striatopodocarpites* and *Faunipollenites ;* nonstriate-disaccates and triletes are rare ; radial monosaccates are almost absent. The findings show an Upper Barakar age for these samples.

R. S. Tiwari, Suresh C. Srivastava, Archana Tripathi and Vijaya Singh

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

Processing of all the available samples, slide preparation, scanning of the slides and detailed morphographic studies for the specific delimitation have been completed. A draft manuscript comprising introduction, geology of the area, history of palynological work with special reference to the Lower Gondwana sediments of India and around, and the classification of sporae dispersae has been written. Two genera have been studied in detail for biometric analysis. Fifty-one samples have been counted statistically.

Suresh C. Srivastava and Rakesh Saxena

*Subproject : Palynological studies of Raniganj coals, West Bengal*

Counting of dispersed pollen and spores from the 20 coal samples of bore-holes GRT-OV, DMV-OV and SS-OV, Raniganj Coalfield has been completed. The samples counted show dominance of striated-disaccate and trilete miospores. *Brevitriletes, Horriditriletes, Lophotriletes, Striatites, Scheuringipollenites, Vesicaspora,* etc. are dominant miospore forms which indicate that the samples belong to Raniganj Formation.

Anand-Prakash

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

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

*Subproject : Palynostratigraphy of the Gondwana sediments in Palar Basin, Chingleput District, Tamil Nadu*

Palynostratigraphy of the Lower and Upper Gondwana sediments accosted in 758 m profile of the bore hole PBK-1 has been investigated. Ninety-eight samples were macerated and a rich mioflora was recovered. The Lower Gondwana sediments, represented by Talchir sediments in the lower 283 m of the bore hole,

are characterized by radial monosaccates, viz., *Plicatipollenites*, *Parasaccites*, *Virkkipollenites*, etc. The mioflora compares very closely with the Talchir miofloras of the Damodar Basin and conform the existence of Talchir sediments in Palar Basin.

The Upper Gondwana sediments, represented by Sriperumbudur Formation in the upper 473 m of the Bore-hole PBK-1, Palar Basin, are characterized by the gymnospermous pollen grains, viz., *Araucariacites*, *Laricoidites*, *Classopollis*, *Callialasporites*, *Podocarpidites*, etc. Pteridophytic spores are comparatively few, viz., *Cicatricosisporites*, *Contignisporites*, *Boseisporites*, *Lycopodiumsporites*, *Cyathidites*, etc. Apart from this presence of *Microcaridites*, *Coptospora*, *Aequitriradites*, is also recorded. The mioflora of the Sriperumbudur Formation compares with the known Lower Cretaceous miofloras of India.

D. C. Bharadwaj and Suresh C. Srivastava

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

The mioflora has been studied from a 919 m thick profile in the bore-hole GRK-1 from Jeyapuram area. The oldest assemblage is marked by the dominance of *Parasaccites* + *Plicatipollenites* + *Potonieisporites*. This assemblage is succeeded by *Callumispora* + *Parasaccites* assemblage, *Scheuringipollenites*+*Faunipollenites* assemblage and *Densipollenites*+*Faunipollenites* assemblage. As compared with the known assemblages they represent the Talchir, Lower Karharbari, Lower-Middle Barakar and Barren Measures miofloras respectively.

The sediments of the bore-hole GCN-27 (380 m) from Chinoor area are very poor in miospores and hence palynostratigraphy could not be built up.

The sediments accosted in bore-hole GGK-20 (900 m) from Ramagundum area are rich in miospores. The oldest mioflora encountered in this bore hole is marked by the dominance of *Parasaccites*, associated with nonstriated-disaccates. This is succeeded by *Scheuringipollenites*+striated-disaccates ; *Densipollenites* + *Faunipollenites* + disaccates ; *Faunipollenites* + *Striatopodocarpites* +

*Scheuringipollenites* and finally by *Striatopodocarpites+Faunipollenites + Crescentipollenites* miofloras. They represent Upper Karharbari, Lower Barakar, Barren Measures and Raniganj miofloras respectively.

The Lower Gondwana sediments of the bore-hole GGK-27 from Ramagundum area have been taken up for palynological investigations.

D. C. Bharadwaj, Suresh C. Srivastava and Neerja Jha

*Project* : *Biopetrology of Indian coal deposits*

*Objective* : *Evaluation of coals for classification and utilization*

*Subproject* : *Biopetrology of Lower Gondwana coal of Godavari Valley*

Illustrations of microconstituental study of Godavari coals, Andhra Pradesh were prepared and a paper is ready for publication.

From the detailed coal typological and maturation studies of Godavari Valley coals, it was possible to correlate most of the coal seams, known only by local names, in different coalfields. Predominance of mixed coal types and association of high mineral matter content in these coals will have particular influence upon their preparation and utilization prospects.

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

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

Morphographic study and quantitative assessment of macerals and microlithotypes alongwith rank determination of 19 coal pellets (samples sent by CMPDI) were completed. Photomicrography was also simultaneously done. The study hitherto carried-out reveals that the coal compares dominantly vitrinite macerals and appreciable amount of carbonate (Siderite, Ankerites & Calcite) and sulphide (Pyrite) minerals.

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

*Subproject : Microscopy of banded coals*

A detailed investigation of these coals from Damuda Basin has been taken up. Lithotypes of samples from Raniganj Coalfield are being examined.

G. K. B. Navale

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

Fifty coal pellets have been prepared for petrological study. A rough draft of petrological studies in India is being prepared.

Rakesh Saxena

*Subproject : Palynopetrological assessment of the Permian coals of India*

A critical assessment has been made on the palynopetrological composition of the Permian coals of India which reveals existence of characteristic assemblages in definite coal types. The data also provides clue on the depositional history of the coals. A paper has been prepared for publication.

G. K. B. Navale

*Subproject : Recognition of composite coal types in Lower Gondwana coals*

A systematic study of petrological composition of Lower Gondwana coals suggest categorization of resembling coal entities into certain types based on source material and composition. Four basic composite coal types have been recognized referable to Karharbari, Lower Barakar, Upper Barakar and Raniganj coal types. These types show distinct geological, palaeobotanical palynological and petrological characteristics.

G. K. B. Navale

*Subproject : Palynostratigraphy and biopetrology of Tertiary (Palaeogene) coals of Upper Assam*

All the palynological, geological and biopetrological data of the coals from Makum Coalfield have been compiled and are being critically examined.

B. K. Misra

**Material from abroad**

Successional samples representing Upper Permian and the Lower Triassic sediments in Hessen Province of the Federal Republic of Germany were palynologically investigated. Morphotaxonomic study has been done and zonations of the assemblages have been determined.

R. S. Tiwari

The paper dealing with the petrographic constitution and maturity of some Australian, Canadian and Nigerian coals for their utilization prospects was finalized and illustrations were prepared. The study revealed that these coals are of varying type and rank. Out of the three Nigerian coal samples, one sample (Engu coal) was found to be consisting of two different coal types, i.e. it was a blend.

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

## DEPARTMENT OF OIL PALYNOLOGY

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

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

*Subproject* : *Palynostratigraphy of the Jowai-Badarpur Road Section, Meghalaya, Assam*

Morphotaxonomical studies of palynomorphs recovered from the Palaeocene-Eocene sediments were continued. Identification and description of the pteridophytic spores represented by 14 genera and 31 species were completed. Tentative identification and preliminary description of angiospermic pollen grains represented by 13 genera and 26 species have been done. They are comparatively low in frequency. The upper part of the Palaeocene

and lower part of the Eocene in the area are marked with the abundance of microplankton. Taxonomic studies on the microplanktons are being carried out.

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

In the Oligocene-Miocene strata pteridophytic spores are quite prominently represented. Morphological descriptions of some spore genera, viz., *Cyathidites, Todisporites, Lygodiumsporites, Striatriletes, Biretisporites, Foveosporites, Verrucosisporites, Polypodiaceaesporites, Polypodiites*, etc. have been written. Systematic mor phological description of gymnospermous and angiospermic pollen grains was started.

H. P. Singh and M. R. Rao

A draft manuscript recording about 16 genera and 40 species of fungal spores/bodies has been prepared. Out of them 12 species are new. A comparison of the present fungal assemblage has been made with the known from the equivalent horizons in India.

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

Lithostratigraphical study of the Bhuban Formation in Jaintia Hills, Meghalaya deals with its definition, lithological peculiarities and distinguishing features. On lithological grounds the formation has been divided into 3 members. This work has been submitted for publication.

*Project* : *Palynostratigraphy of Tertiary sediments of Upper Assam*

*Objective* : *To determine palynological succession of the Tertiary sediments of the region and its role in the identification of different stratigraphical horizons*

Chemical processing of 10 samples from the Tipam Sandstone Formation and eight samples from the Girujan Clay Formation has been carried out. Of these, two samples from each formation have yielded miospores. The preliminary observations reveal that both the assemblages are dominated by pteridophytic spores.

R. K. Kar and S. K. Dutta

Some polliniferous slides belonging to the Naogaon Stage (Bareil Group) from the Makum Coalfield were scanned. The spore-pollen assemblage seems to have mostly pteridophytic spores angiospermic pollen grains and some algal forms.

Pramod Kumar

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

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

Forty-two out of 87 stratigraphically located samples of the Subathu Formation exposed in the Banethi-Bagthan area of Sirmur District have yielded a rich mioflora. Photomicrography of some good specimens has been carried out. The mioflora consists of spores, pollen grains, microplankton and fungal spores. Morphotaxonomical observations on about 67 genera and 111 species have been made. Finalization of this taxonomic work is in progress. Preliminary observations on the present assemblage reveal that it exhibits increased incidence of land derived elements as compared to Kalka—Simla Highway sections. Some productive horizons have been located in the Dagshai and Kasauli formations. The assemblages are both qualitatively and quantitatively poor. Morphotaxonomical study of these assemblages has been started.

H. P. Singh and Samir Sarkar

A paper entitled 'Tertiary palynology of the Himalaya : A review' evaluates the status of Tertiary palynology of the Himalaya together with an assessment of the stratigraphical potential of some of the assemblages. The paper has been submitted for publication.

H. P. Singh

A few samples of the Lower Tertiary from the Dharamsala area have proved palynologically productive.

R. K. Saxena

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

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

The Upper Siwalik palynoflora from the Gagret-Bharwain Road Section in Una District, Himachal Pradesh consists of 10 genera and 14 species, of which 4 species are new. The assemblage is dominated by gymnospermous pollen grains. On the basis of palynological evidences the present assemblage seems to belong to the middle part of the Upper Siwalik sequence.

Three out of 18 samples from the Siwalik sediments exposed along the Kala Amb-Nahan Road Section in Sirmur District of Himachal Pradesh have yielded palynomorphs.

A manuscript incorporating a detailed morphological study of *Pinjoriapollis*, a new fossil genus from the Pinjor Formation exposed near Chandigarh was prepared and sent for publication.

R. K. Saxena and H. P. Singh

Palynological investigations of Ramshahr Well no. 1 have been completed. Based on the qualitative and quantitative analyses of the assemblages, three palynological zones have been identified. The sediments seem to have been deposited under fresh water condition and can possibly be assigned to Middle-Upper Miocene age. The rock samples for this study were supplied by the O.N.G.C., Dehradun.

H. P. Singh and Samir Sarkar

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

*Objective* : *To study morphotaxonomy and distribution of phytoplanktons of the marine Mesozoic and Cenozoic sediments of India and their utilization in biostratigraphy*

Morphotaxonomy of Upper Palaeocene nannoplankton recovered from Vriddhachalam area has been completed. A manuscript entitled 'Upper Palaeocene Calcareous nannoplankton from

Vriddhachalam area, Cauvery Basin, southern India' has been submitted for publication. It includes 8 genera and 16 recognizable species. The zone marker species, *Discoaster multiradiatus*, marks the presence of standard Nannoplankton Zone NP9, Upper Palaeocene (Sparnacian) is identified.

K. P. Jain, Rahul Garg and D. C. Joshi

Preparation of a manuscript on additional radiolaria from Uttatur Formation was continued. Seven genera have been identified. Hagiastric Group has been identified to be significant for Cretaceous biostratigraphy.

Rahul Garg and K. P. Jain

Two papers 'Cenozoic dinoflagellate cysts and acritarchs from sedimentary formations of India : A critical review' and 'Studies on fossil dinoflagellate cysts and acritarchs in India : A review' have been prepared.

All information concerning the identification and stratigraphic distribution of fossil dinoflagellate cysts and associated acritarchs from various parts of India has been critically assessed and tabulated. The reports consisting of references and descriptions of these fossils till 1969 have been considered to be of more historical significance than biostratigraphic or taxonomic. Some reallocations of taxa have been suggested and discussed.

K. P. Jain

*Project* : *Palynostratigraphy of Neogene sediments in Kachchh*

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

An assemblage consisting of spores, pollen grains, algal and fungal bodies and microplankton has been recovered from the Khari Nadi Formation (Lower Miocene), Kachchh. Systematic description of spores and pollen grains has been completed. The spores and pollen grains have been assigned to 9 and 10 genera respectively. The assemblage is dominated by pteridophytic spores and is mostly represented by the genus *Striatriletes*. Among the angiospermic pollen grains, *Malvacearumpollis* is most common.

Besides, some gymnospermic pollen grains, viz., *Pinuspollenites*, *Abiespollenites*, *Piceapollenites*, *Podocarpidites* and *Tsugaepollenites* are also frequently found in the assemblage.

R. K. Kar

Palynological investigations of bore core no. 27 supplied by the Directorate of Geology and Mining, Government of Gujarat have also been completed. The Directorate postulated a Lower Eocene age to the bore core 27 while geologists of the O.N.G.C. thought it to be of Miocene age. But on the basis of the presence of palynomorphs like *Striatriletes susannae*, *S. multicostatus*, *Cheilanthoidspora enigmatas*, *Polypodiaceaesporites strictus*, *Palmaepollenites kutchensis*, *Couperipollis kutchensis* and *Oligosphaeridium* complex, the bore core 27 has been dated as Middle-Upper Eocene

R. K. Kar and R. K. Saxena

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

*Objective* : *To locate palynological productive horizons followed by detailed morphotaxonomical study of the recovered palynomorphs*

Rock samples collected from the so-called Intratrappean beds of Lalitpur District have yielded palynological fossils. Besides, samples from Mandla, Madhya Pradesh have also proved productive. The assemblage is not rich and consists of microthyriaceous ascostromata and other fungal bodies, pteridophytic spores, gymnospermous and angiospermous pollen grains.

R. K. Kar

Preparation of a paper on the morphological study of the polycolpate palynomorphs from Indian Tertiary sediment started with the objective of sorting out each valid and invalid genus, properly placing various species described thereunder, bringing out consistency in the criteria for generic and specific differentiation and accordingly emending the diagnosis of the taxa, wherever necessary.

R. K. Saxena

*Project* : *Palynostratigraphy of Mesozoic sediments of Satpura Gondwana Basin, Madhya Pradesh*

*Objective* : *To investigate palynomorph assemblages from the Jabalpur Formation for their morphotaxonomical studies*

Quantitative analysis of the sample no. 1761/2 from Hathidoba reveals that the assemblage is dominated by the genus *Calialasporites* followed by *Araucariacites*. Pteridophytic spores are poor in occurrence.

Quantitative analysis of samples from Pat-Baba ridge has been completed. The saccate genus *Podosporites tripakshii* occurs in dominance (46.5%) whereas *Cyathidites* (22%) and *Callispora* (10%) are in subdominance. *Araucariacites* and *Callialasporites* are poorly represented.

Pramod Kumar

**Material from abroad**

*Miofloristic study of Triassic-Liassic sediments from Iran*

Morphotaxonomic study of the assemblage has been completed; 30 genera and 41 species have been described. Quantitative analyses of the assemblages have yielded interesting results.

D. C. Bharadwaj and Pramod Kumar

## GEOCHRONOLOGY LABORATORY

*Project* : *Radiocarbon Dating*

*Objective* : *C-14 Dating of Quaternary deposits in relation to palynological investigations and dating of archaeological and geological materials*

The Laboratory has processed 110 samples for dating ; dates for 75 samples have been communicated to submitters. Five test samples, 25 anthracite background and 5 Radiocarbon Standard (NBS oxalic Acid) have also been processed and counted. Of the dated samples, nearly 70% samples belong to Quaternary studies and the rest to archaeologic investigations.

*Ladakh Series*—The leafy material from the sediment sample at 2.5 m in the second terrace of Tsokar Lake was separated and dated to 13,550 yrs B. P. whereas the sediments samples from the first terrace and at top level give dates around 6000 yrs B. P.

The profile from Pangong Lake was dated to mark chronologically the vegetational changes occurring near the glacial conditions of the lake. The age measurements made on 3 samples indicate an inverse correlation with depth. The surface sample is dated to 6,650 yrs B. P.

*Nilgiri Series*—Some samples from peat profiles from Kakathope have been dated. The dates confirm the rate of sedimentation derived for another profile in the region.

*Silent Valley Series*—Two profiles, each of one metre depth, from Silent Valley sediments were dated. The ages of the samples at one metre depth was approximately 800 yrs B. P. indicating recent nature of deposition.

*Tripura Series*—Clay deposits with peat beds at nearly 3 m depth from Chandrpur and Bisalgarh were dated for a study of vegetational changes in the regions. The age measurements were consistent with depth giving a rate of sedimentation of nearly 8 cm/100 yrs for both locations. The buried wood pieces in the peat beds gave very different ages.

An increase of about 0.5 cpm in the background counting rate of anthracite samples, processed immediately after some of the shell or peat samples, was observed, which was due to random contamination following its decay. The molecular sieve and silica gel graps in the combustion system only were found to be contaminated and required changing.

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

*Project* : *Fission track dating*

*Objective* : *To establish fission track dating method and to develop techniques to apply the method for dating various rock types with special reference to fossiliferous strata*

*Calibration of microscope glass slide with U standard glasses*—Small quantities of F-T Uranium standard glasses were obtained from

National Bureau of Standards, U.S.A. and various F-T dating labs. To use these standards on a routine basis and in good measure and to calibrate the thermal neutron flux with higher accuracy, the U concentration and the homogeneity of its distribution in ordinary microscope slides have been investigated.

The suitability of microscope glass slides made by a certain Industrial Corporation of Bombay, for thermal neutron fluence measurements in F-T dating was examined. It has been established experimentally that these microslides can be substituted for F-T Uranium standard glasses like NBS SRM 962, GE-Fisher, Corning and Kleeman glasses. Repeated measurements on the irradiated microslides up to four depth levels have been carried out after removing the surface tracks at each stage by grinding a minimum surface thickness of 20 $\mu$m (confirmed through observation under microscope), etching and scanning to study spatial distribution of U in them. U concentration in these slides has been found to be uniform at levels of $0.5 \pm 0.03$ ppm and are thus suitable as the thermal neutron dosimeter over a wide range of fluence from $10^{12}$ to $10^{18}$M/cm$^2$. A report giving experimental details and results has been sent for publication.

*Fission track annealing characteristics*—To determine closing temperature of F-T system the time-temperature diagrams of Kyanite were used. A closing temperature of 80°C corresponding to 0.1-10 Ma annealing time has been determined. Activation energy for different degrees of track fading varies from 1.0 to 1.6 eV.

Studies of track annealing characteristics on beryl, tourmaline, stilbite, augite, calcite, magnetite, feldspar quartz, etc. were continued.

*Dating*—Some sedimentary samples from the Palaeozoic Department were scanned for F-T age measurements on 'in situ' apatite, sphene and zircon grains before and after thermal neutron bombardment. These samples are from Iron Ore Series, Jamshedpur. The apatite F-T ages have been determined as $683 \pm 70$, $1137 \pm 125$, $1151 \pm 146$ and $996 \pm 103$ Ma for sample Nos. BSFT 1, 2, 3 and 4 respectively. Since the known age of Iron Ore Series from elsewhere are more than 2000 Ma, the apatite F-T age of these samples from the area date the last thermal episode

cooling below a temperature of 130°C (130°C being the F-T closing temperature of apatite).

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

## Research in Collaboration

**Iron-ore Supergroup**

Study of biota around Bhadrasai, Keonjhar District (3,000 m.y.) has been completed. Biota comprises spheroidal cells with thickening, cells arranged in filament with hetrocyst-like structure, globular colony, flat colony and cells showing division (with G.S.I., Orissa Circle).

**Delhi Supergroup**

Shale, chert, dolomite and stromatolitic limestone samples belonging to Ajabgarh and Alwar groups around Baraud and Alwar have been worked out for microbiota. Only one sample has yielded microbiota (with G.S.I., Western Circle, Palaeontology Laboratory).

**Ganga Valley**

Study of microbiota of pre-Tertiary sediments of Ujahani, Tilhar and Kasganj areas was completed. The biota closely resembles the Upper Vindhyan microbiota (with O.N.G.C.).

**Precambrian-Cambrian Boundary**

Thin sections and macerates of samples from Shundi-Lada, Wannar and Murli sections and Thaiyan of Lolab Valley of Kashmir, Rupshu area of Ladakh and Prahio, Pin and Kunzam sections of Spiti have yielded several problematic microbiota and cryptarchs (with G.S.I., Northern Region, Himalayan Geology Division, IGCP-29).

**Silurian of Spiti**

Recorded problematic fossils of uncertain affinities. Cellular pulls show peculiar hystrichosphaerids-like structure (with G.S.I., Northern Region, Himalayan Geology Division).

**Glossopteris species from Australia**

Differences have been recorded in some similar looking Indian and Australian species of *Glossopteris*, e.g. *G. acuta* (=*G. formosa*), *G. elongata* (=*G. retifera*,), *G. ampla* (=*G. damudica*), *G. taeniopteroides* (=*G. syaldiensis*), *G. wilkinsonii* (=*G. euryneura*), *and G. gangamopteroides* (=*G. communis*). Some of the Indian species wrongly reported from Australia were restudied. They are either placed under a new name or placed in the existing Australian species (with Queensland Geological Survey).

**Permo-Triassic Boundary in Himalayas**

Palynological studies of marine Permian and Triassic sediments from Shalshal/Bolibager sections, Chamoli District, U.P. with special reference to Permo-Triassic boundary were undertaken. (with Himalayan Geology Division, Northern Region, G.S.I., Lucknow).

A treatise entitled 'Elucidation of Mesozoic cycadophytes, in collaboration with Professor T. Delevoryas, Department of Botany, University of Texas, U.S.A., is in progress.

A petrified palm wood was described, photographed and a manuscript prepared (with Dr R. Ruffle of the Museum für Naturkunde, East Berlin).

Eight more fossil woods from the Miocene of Congo were studied, described and tentatively identified (with Mr. J. Lepersonne of the Musee Royal de l'Afrique Centrale, Tervuren, Belgium).

Studies on the plant megafossils from the Karewa beds of Kashmir have been taken up (with Physical Research Laboratory, Ahmedabad).

Palynostratigraphical studies on grab and core samples from the Indian ocean were continued (with National Institute of Oceanography, Goa).

Pollen analysis of Karewa samples from Hirpur and Wapjan have yielded qualitatively as well as quantitatively rich assemblage. However, samples from Nagum (Upper Karewa) are not very promising. Besides pollen and spores, a good number of seeds and fruits have been recovered. Two papers, one each from Wapjan and Hirpur, have been prepared in the form of drafts.

Three pollen spectra, one from Wapjan and two from Hirpur and two photoplates for the reports which were presented in Kashmir Palaeoclimate Project Workshop, held at Ahmedabad were prepared (with Physical Research Laboratory, Ahmedabad).

Two out of ten samples from Kalidhang, district Sirmur, Himachal Pradesh yielded palynomorphs. These are dominated by oaks (with G.S.I., Himachal Pradesh Circle).

The investigations of Eocene Coal from Malaya were completed. The miospore assemblage consists of 18 genera and 18 species. In the presence of *Verrucatosporites usmensis* and *Malayaeaspora costata* it was postulated that coal sample should be of Middle-Late Eocene age (with the Department of Botany, Lucknow University).

A manuscript entitled 'Tethyan Cretaceous radiolaria from Malla Johar, Kumaon Himalaya, Uttar Pradesh, India' has been finalized and submitted for publication. The radiolaria from the Lower to Upper Cretaceous sequence are identified into 4 distinct biofacies. The study of dinoflagellate cysts and miospores from Upper Jurassic Spiti Shale (Formation) was continued. A total of 54 species of dinocysts have been recognized. Their first appearance at different levels is marked to differentiate the informal biozones (with Department of Geology, Lucknow University).

Dinoflagellate cysts and acritarchs from a Middle Eocene sequence exposed between Ratchalo and Baranda in South-west Kachchh were studied. It includes 48 taxa, of these six species are new. Based on first appearance of species at different levels, five informal biozones have been recognized. A manuscript embodying this information has been prepared and submitted for publication (with Department of Geology, Lucknow University).

## Papers Published

Anand-Prakash (1980). A study of landforms near Jaisalmer, Rajasthan. *Geophytology*, **10** (1 & 2) : 37-44.

Anand-Prakash (1980). Geomorphic evolution of Lik River, South of Pokaran, Rajasthan. *Geophytology*, **10** (1 & 2) : 58-61.

Anand-Prakash (1980). Geomorphic evolution of saline depressions near Pokaran, Rajasthan, India. *Geophytology*, **10** (1 & 2) : 96-103.

Awasthi, N. (1980). Two new dipterocarpaceous woods from the Cuddalore Series near Pondicherry. *Palaeobotanist*, **26** (3) : 248-256.

Awasthi, N., Guleria, J. S. & Lakhanpal, R. N. (1980). A fossil dicotyledonous wood from the Pliocene beds of Mothala, District Kachchh, western India. *Palaeobotanist*, **26**(3) : 199-205.

Bande, M. B. & Khatri, S. K. (1980). Some more fossil woods from the Deccan Intertrappean beds of Mandla District, Madhya Pradesh, India. *Palaeontographica*, **173B** : 147-165.

Bande, M. B. & Prakash, U. (1980). Fossil woods from the Tertiary of West Bengal. *Geophytology*, **10**(1 & 2) : 146-157.

Bande, M. B. & Prakash, U. (1980). Four new fossil dicotyledonous woods from the Deccan Intertrappean beds of Mandla District, Madhya Pradesh. *Geophytology*, **10** (1 & 2) : 268-271.

Bose, M. N. & Banerji, J. (1980). The occurrence of *Sagenopteris* Presl in Kachchh, India. *Palaeobotanist*, **26** (3) : 226-229.

Dutta, S. K. & Jain, K. P. (1980). Geology and palynology around Lumshnong area, Jaintia Hills, Meghalaya, India. *Biol. Mem.*, **5**(1) : 56-81.

Dutta, S. K. & Singh, H. P. (1980). Palynostratigraphy of sedimentary formations in Arunachal Pradesh-1. Palynology of Siwalik rocks of Lesser Himalaya, Kameng District. *Proc. IV Int. palynol. Conf., Lucknow (1976-77)*, **2** : 617-626.

Jain, K. P. (1980). Reallocation of some dinoflagellate cysts from Kachchh, western India. *J. palaeontol. Soc. India*, **23-24** : 140-143.

Kar, R. K. (1980). Permian miospores in the Miocene sediments of Kachchh, Gujarat. *Geophytology*, **10**(1 &2) : 171-173.

Khanna, A. K. & Singh, H. P. (1980). *Subathua*—A new dinoflagellate genus and its palaeoecological significance in the Subathu Formation, Simla Hills. *Palaeobotanist*, **26**(3) : 307-313.

Kumaran, K. P. N. & Maheshwari, H. K. (1980). Upper Triassic spores dispersae from the Tiki Formation—2. Miospores from the Janar Nala Section, South Rewa Gondwana Basin, India. *Palaeontographica*, **173B**(1—3) : 26-48.

Lakhanpal, R. N. & Prakash, U. (1980). Suggestions regarding the nomenclature of fossil dicotyledonous woods. *Modern Trends in Plant Taxonomy—5. Glimpses in Plant Research*. Vikas Publishing House, New Delhi, pp. 199-208.

Lalitha, C. & Prakash, U. (1980). Fossil woods of *Sindora* from the Tertiary of Assam with a critical analysis of anatomically allied forms. *Geophytology*, **10**(1 & 2) : 174-187.

Lele, K. M. & Shukla, M. (1981). Studies in the Talchir Flora of India-12. Palynology of the Talchir Formation of Hutar Coalfield, Bihar. *Geophytology*, **10**(1 & 2) : 231-238.

Maithy, P. K. (1980). Record of microbiota from the Penganga Formation (Precambrian), Wardha Valley. *Geophytology*, **10**(1 & 2) : 267.

Maithy, P. K. (1980). *Neoscytonema*, a new name for *Palaeoscytonema* Maithy & Shukla. *Geophytology*, **10**(1 & 2) : 280.

Maithy, P. K. (1980). Stromatolitic microbiota. *Geol. Surv. India, Misc. Publ.*, **44** : 19-25.

Maithy, P. K. & Gupta, S. (1980). Archaeocyatha from the Vindhyan Supergroup of India. *Indian J. Earth Sci.*, **8**(1) : 76-81.

Navale, G. K. B. (1980). Evaluation of genetic coal types by palynological methods. *Proc. IV Int. palynol. Conf., Lucknow (1976-77)*, **2** : 610-616.

Navale, G. K. B. & Misra, B. K. (1980). Classification of composite microlithotypes of lignite. *Geophytology*, **10**(1 & 2) : 54-57.

Navale, G. K. B. & Misra, B. K. (1980). Systematic study of organic microconstituents of the main seam of Neyveli Lignite, South India. *Geophytology*, **10**(1 & 2) : 245-264.

Navale, G. K. B. & Misra, B. K. (1980). Maturation studies of some Indian coals and lignites and their bearing on oil and gas prospecting. *Proc. IV Int. palynol. Conf., Lucknow (1976-77)*, **2** : 551-564.

Prakash, U. & Ambwani, K. (1980). A petrified *Livistona*-like palm stem, *Palmoxylon livistonoides*, from the Deccan Intertrappean beds of India. *Palaeobotanist*, **26**(3) : 297-306.

Prakash, U. & Bande, M. B. (1980). Some more fossil woods from the Tertiary of Burma. *Palaeobotanist*, **26**(3) : 261-278.

Prasad, M. N. V. & Chandra, S. (1980). *Palaeospiroxylon*—A new gymnospermous wood from the Raniganj Coalfield. *Palaeobotanist*, **26**(3) : 230-236.

Rajagopalan, G., Sekar, B. & Vishnu-Mittre (1980). Birbal Sahni Institute Radiocarbon measurements-II. *Radiocarbon*, **22**(1) : 54-60.

Rigby, J. F., Maheshwari, H. K. & Schopf, J. M. (1980). Revision of Permian plants collected by J. D. Dana during 1839—1840 in Australia. *Geol. Surv. Qd, Publ.*, 376, *Palaeont. Pap.*, **47** : 1-25.

Sah, S. C. D., Singh, R. Y. & Singh, H. P. (1980). Palynological zonation of the Tipam Group in Nahorkatiya area of Upper Assam. *Proc. IV Int. palynol. Conf., Lucknow (1976-1977)*, **2** : 635-642.

Saxena, R. K. (1980). Palynology of the Matanomadh Formation in type area, north-western Kachchh, India (Part-3). Discussion. *Palaeobotanist*, **26**(3) : 279-296.

Saxena, R. K. & Singh, H. P. (1980). Occurrence of palynofossils from the Pinjor Formation (Upper Siwalik) exposed near Chandigarh. *Curr. Sci.*, **49**(2) : 479-480.

Singh, H. P. & Khanna, A. K. (1980). Palynology of the Palaeogene marginal sediments of Himachal Pradesh, India. *Proc. IV Int. palynol. Conf., Lucknow (1976-77)*, **2** : 462-471.

Singh, H. P. & Saxena, R. K. (1980). Upper Siwalik palynoflora from Gagret-Bharwain Road Section, Himachal Pradesh. *Geophytology*, **10**(2) : 278-279.

Singh, T. & Prakash, U. (1980). Leaf-impressions from the Siwalik sediments of Arunachal Pradesh. *Geophytology*, **10** (1 & 2) : 104-107.

Srivastava, A. K. (1980). Stratigraphical bearing of megaflora in the Lower Gondwana succession of Auranga Coalfield, Bihar. *Palaeobotanist*, **26**(3) : 214-220.

Srivastava, Suresh C. (1980). Palynostratigraphy of Lower Gondwana sediments of Chirimiri Coalfield, M. P., India. *Geophytology*, **10**(1 & 2) : 62-71.

Srivastava, Suresh C. (1980). Miofloral succession of the Lower Gondwanas in the North Karanpura Coalfield. *Geophytology*, **10**(1 & 2) : 29-33.

Srivastava, Shyam C. (1980). Morphographic variations—*in situ* spores and pollen from the Triassic of India. *Proc. IV Int. palynol. Conf., Lucknow (1976-77)* **2** : 309-312.

Sukh-Dev (1980). Occurrence of the genus *Yabeiella* Oishi in the Jabalpur Formation, *Palaeobotanist*, **26**(3) : 257-260.

Sukh-Dev & Zeba Bano (1980). Some plant remains from Hoshangabad District, Madhya Pradesh. *Palaeobotanist*, **26**(3) : 206-213.

Tiwari, R. S. (1980). Palynostratigraphy of Permo-Triassic transition in India. *Proc. IV Int. palynol. Conf., Lucknow (1976-77)*, **2** : 199-207.

Tiwari, R. S. (1979). Palynological dating of subsurface Triassic strata near Durgapur, West Bengal. *Palaeobotanist*, **26**(2) : 190-197.

Tiwari, R. S. & Rana, V. (1980). A Middle Triassic mioflora from India. *Biol. Mem.*, **5**(1) : 30-55.

Tiwari, R. S., Tripathi, A., Kumar, S., Singh, I. B. & Singh, S. K. (1980). Gondwana plant microfossils from the Tethyan sediments, Malla Johar Area, Uttar Pradesh. *J. palaeont. Soc. India*, **23 & 24** : 39-42.

Vishnu-Mittre (1979). Botanical materials and methods in archaeology. *Ancient Ceylon*, **3** : 373-377.

Vishnu-Mittre (1979). Ancient food economy in India with remarks on the Aryan hypothesis. *Ancient Ceylon*, **3** : 378-384.

Vishnu-Mittre (1981). Wild plants in Indian folk life—A historical perspective, pp. 37-58 in S. K. Jain (Ed.)—*Glimpses of Indian Ethnobotany*. Oxford & IBH, Calcutta.

Vishnu-Mittre & Savithri, R. (1979). Palaeobotanical and palynological investigations: A review. *Indian Archaeol., 1975-1976*: 86-88.

Vishnu-Mittre, Savithri, R. & Kajale, M. D. (1980). Palaeobotanical and palynological investigations. *Indian Archaeol.*: *A review—1976-77* : 90-92.

Vishnu-Mittre & Saxena, A. K. (1980). Environmental analysis of Holocene pollen from shallow saline and fresh water depressions in the Rajasthan desert, pp. 35-39 in M. S. Mann (Ed.)—*Arid Zone Research & Development*. Harvard Press, Jodhpur.

Zeba-Bano (1980). Some pteridophytes from the Jabalpur Formation. *Palaeobotanist*, **26**(3) : 237-247.

## Field Work

During the session 1980-1981, members of the scientific staff of the Institute visited a large number of areas for field studies and collection of plant megafossils and palynological samples.

1. Rock samples and organo-sedimentary structures from the Vindhyan Supergroup from the Mirzapur area, Uttar Pradesh (Manoj Shukla and R. Babu).

2. Samples from the Kushalgarh and Rowly formations belonging to Ajabgarh and Alwar groups respectively from around Alwar, Baraud and Jaipur, Rajasthan (J. Mandal).

3. Lower Gondwana plant megafossils and palynological samples from the Rajmahal Hills, Bihar and Raniganj Coalfield, West Bengal (A. K. Srivastava, Manoj Shukla and B. Prasad).

4. Palynological samples from the Bhadhaura Formation, Bap-Bhadhaura Road near Bap, Jodhpur District, Rajasthan (Suresh C. Srivastava).

5. Palynological samples of the Talchir Formation from bore hole PBK-2, near Sambarampakkam, Chingleput District, Tamil Nadu (Suresh C. Srivastava).

6. Plant fossils of the Karharbari Formation from the Giridih Coalfield, Bihar (P. K. Maithy and S. Chandra. Mr. J. F. Rigby of Queensland Geological Survey accompanied).

7. Palynological samples from the Kamthi Formation exposed around Nanthani, Sitampetta, Rangayapalli and Ramagundam, Karimnagar District, Andhra Pradesh (Suresh C. Srivastava).

8. Plant megafossils from Yorkshire, Moors Localities of Hasty Bank and Roseberry Topping, Scarborough and Scalby Mills plant beds of Yorkshire ; and Opencast Carboniferous localities near leeds (M. N. Bose).

9. Plant megafossils and bulk maceration samples from the Triassic and Cretaceous of Shahdol District, Madhya Pradesh (Sukh Dev, Shyam C. Srivastava and P. K. Pal).

10. Triassic plant megafossils from the area around Asansol, West Bengal (P. K. Pal).

11. Plant megafossils from the Jurassic of Rajmahal Hills, Bihar (P. K. Pal).

12. Plant fossils and palynological samples of various Jurassic-Cretaceous formations exposed in Rajasthan and Gujarat (M. N. Bose, H. K. Maheshwari, Jayasri Banerji and B. N. Jana).

13. Tertiary palynological samples from Palana and Kolayat, Rajasthan (K. Ambwani).

14. Leaf impressions, fossil woods and lignite samples of Tertiary age from a number of localities in Rajasthan and Gujarat (J. S. Guleria).

15. Fossil woods, petrified fruits and leaf impressions from the Deccan Intertrappean Series in Mandla District, Madhya Pradesh (U. Prakash, M. B. Bande and R. C. Mehrotra).

16. Petrified and carbonised woods and palynologcal samples of Tertiary age from Pondicherry area, Neyveli and Kerala Coast (N. Awasthi and K. Ambwani).

17. Palynological samples of Tertiary age from Kachchh District, Gujarat and Infratrappean beds of Lalitpur District, Uttar Pradesh (R. K. Kar).

18. Palynological samples from Subathu, Kasauli, Nahan and Siwalik sediments exposed along the road and stream sections in Sirmur District, Himachal Pradesh (H. P. Singh, R. K. Saxena and S. Sarkar) and from Subathu, Dharamsala and Nahan (?) sediments around Dharamsala, Kangra District, Himachal Pradesh (P. Kumar, R. K. Saxena and M. R. Rao).

19. Palynological material from the Cauvery Basin (K. P. Jain and Rahul Garg).

20. Lignite samples for biopetrological and palynological studies from Neyveli Lignite field, Tamil Nadu, Varkala Sea Cliff Section, Cannanore Cliff Section, Kerala and some bore core samples (G. K. B. Navale and B. K. Misra).

21. Geomorphological studies on the western Rajasthan rann, geological studies in Kachchh Basin and collection of coal and lignite samples (Anand Prakash).

22. Palynological samples from Lower and Upper Karewas (H. P. Gupta) ; alpine region of Ladakh (A. Bhattacharya).

23. Palynological samples and data on modern forest types from Rajasthan (A. K. Saxena).

24. Archaeobotanical samples from Dadupur near Banthra, Lucknow District (Vishnu-Mittre and A. K. Saxena).

25. Palynological samples from the Triassic Buntsandstein exposures near Heldra Village and Brennen fels bei Brand in Hessen, West Germany (R. S. Tiwari).

26. For collection, comparison of material and consultations, the research staff visited : Suratkal Regional Engineering College, Geological Survey of India and Directorate of Geology and Mining, Karnataka (G. K. B. Navale and B. K. Misra); Forest Research Institute, Dehradun (N. Awasthi and J. S. Guleria); Marine Institute, Porto Novo (A. Chandra and R. R. Yadav); French Institute, Pondicherry (A. Chandra and Vishnu-Mittre); Institute of Science, Bangalore (Vishnu-Mittre); and Central Arid Zone Research Institute, Jodhpur (A. K. Saxena).

## Group Discussions

During the session a number of group discussions were held on certain selected topics. Specialists from within the Institute discussed the problems assigned to them. Other Institute staff viewed the proceedings and also participated by seeking more data/clarification or by offering comments.

1. *Precambrian Palaeobiology*—P. K. Maithy (Convener), Manoj Shukla, J. Mandal and Bijai Prasad.

2. *Glossopteris Flora from India*—Shaila Chandra (Convener), A. K. Srivastava and Bijai Prasad.

3. *Typology of Lower Gondwana coals*—G. K. B. Navale, (Convener), B. K. Misra and R. Saxena.

4. *Miospores and their significance in stratigraphy of Lower Gondwana sequence*—D. C. Bharadwaj (Convener), R. S. Tiwari, S. C. Srivastava and Anand-Prakash.

5. *Mesozoic floras from the Kachchh Basin*—M. N. Bose, Jayasri Banerji, B. N. Jana and H. K. Maheshwari (Convener).

6. *Mesozoic floras from the South Rewa Gondwana Basin*—Sukh-Dev (Convener), H. K. Maheshwari, Shyam C. Srivastava and P. K. Pal.

7. *Deccan Intertrappean Flora of India*—U. Prakash (Convener), Anil Chandra, M. B. Bande and K. Ambwani.

8. *Tertiary Flora of Kachchh and Rajasthan*—R. N. Lakhanpal (Convener), N. Awasthi, K. Ambwani, J. S. Guleria and V. Lalitha.

9. *Cenozoic palynostratigraphy in India*—H. P. Singh (Convener), R. K. Kar, Pramod Kumar, R. K. Saxena, S. K. M. Tripathi and M. R. Rao.

10. *Fossil dinoflagellate cysts and acritarchs with special reference to their distribution in the Tertiary sedimentary formations of India*—K. P. Jain (Convener), R. K. Saxena, Rahul Garg and S. Sarkar.

11. *Reconstruction of vegetation and environment in the Early Pleistocene in India*—Vishnu-Mittre (Convener), H. P. Gupta and Chhaya Sharma.

12. *Late Quaternary vegetation of India*—Vishnu-Mittre (Convener), H. A. Khan, A. K. Saxena, A. Bhattacharya, Aruna Sharma and Chanchala.

13. *Radiometric dating*—G. Rajagopalan (Convener), H. S. Saini and A. P. Srivastava.

## Papers read at Conferences/Symposia/ Meetings, etc.

N. Awasthi—Tertiary plant megafossils of the Himalaya. XI Himalayan Geology Seminar, Wadia Institute of Himalayan Geology, Dehradun.

N. Awasthi—Megaplant fossils from the Karewas. Kashmir Palaeoclimate Project Workshop, Physical Research Laboratory, Ahmedabad.

M. N. Bose—Mesozoic Flora of Kachchh, India. First International Palaeobotanical Conference, Reading, U. K.

Rahul Garg and K. P. Jain—Tethyan Cretaceous radiolaria from Malla Johar area, Kumaon Himalaya, Uttar Pradesh, India. XI Himalayan Geology Seminar, Wadia Institute of Himalayan Geology, Dehradun. (Paper prepared in collaboration with S. Kumar, I. B. Singh and S. K. Singh of Lucknow University).

H. P. Gupta and Chhaya Sharma—Quaternary palynostratigraphy in India—A critical review. IAP Workshop on Cenozoic Stratigraphy and Palynology in India, Lucknow.

H. P. Gupta and Chhaya Sharma—Preliminary report on the pollen-analytical results of Wapjan, Kashmir. Kashmir Palaeoclimate Project Workshop, Physical Research Laboratory, Ahmedabad. (Report prepared in collaboration with D. P. Agarwal and R. K. Pant of Physical Research Laboratory, Ahmedabad).

H. P. Gupta and Chhaya Sharma—Pollen analytical results on the Hirpur Lower Karewa, Kashmir. Kashmir palaeoclimate Project Workshop, Physical Research Laboratory, Ahmedabad. (Report prepared in collaboration with D. P. Agarwal, R. Dodia, C. Mandavia and R. K. Pant of Physical Research Laboratory, Ahmedabad).

K. P. Jain—Cenozoic dinoflagellate cysts and acritarchs from sedimentary formations of India: A critical review. IAP Workshop on Cenozoic Stratigraphy and Palynology in India, Lucknow.

K. P. Jain—Studies on fossil dinoflagellate cysts and acritarch in India : A review. Symposium on Three decades of development in stratigraphy and palaeontology in India, Hyderabad.

K. P. Jain, Rahul Garg and D. C. Joshi—Upper Palaeocene nannoplankton from Vriddhachalam area, Cauvery Basin. IX Indian Colloquiuum on micropalaeontology and stratigraphy, Udaipur.

K. P. Jain and Rahul Garg—Upper Jurassic dinoflagellates and other microfossils from the Spiti Shale, near Laptal, Malla Johar area, Kumaon Himalaya, Uttar Pradesh. XI Himalayan Geology Seminar, Wadia Institute of Himalayan Geology, Dehradun. (Paper prepared in collaboration with S. Kumar, I. B. Singh and S. K. Singh of Lucknow University).

K. P. Jain and Rahul Garg—Biostratigraphy and palaeoecology of the Spiti Shale (Formation), near Laptal, Malla Johar area, Kumaon Himalaya, Uttar Pradesh. XI Himalayan Geology Seminar, Wadia Institute of Himalayan Geology, Dehradun. (Paper prepared in collaboration with S. Kumar, I. B. Singh, M. P. Singh and S. K. Singh of Lucknow University and J. Krishna of Banaras Hindu University).

R. K. Kar—Palynology as a tool to decipher palaeoenvironments. Seminar on the modern trends in morphology, taxonomy, plant physiology and ecology, Kanpur.

K. M. Lele and P. K. Maithy—Precambrian and Palaeozoic floras of Himalayas. XI Himalayan Geology Seminar, Wadia Institute of Himalayan Geology, Dehradun.

H. K. Maheshwari—Mesozoic plant fossils from the Himalayas. XI Himalayan Geology Seminar, Wadia Institute of Himalayan Geology, Dehradun.

G. K. B. Navale—Genesis of Indian Lower Gondwana Coals. Coal Symposium, Varanasi.

H. S. Saini—Tectonic uplift and cooling history of Indian subcontinent as revealed by fission track analysis. III Indian Geological Congress, Pune.

H. P. Singh—Palaeogene palynostratigraphy of Simla Hills. IAP Workshop in Cenozoic stratigraphy and palynology in India, Lucknow.

H. P. Singh—Tertiary palynology of the Himalaya—A review. XI Himalayan Geology Seminar, Wadia Institute of Himalayan Geology, Dehradun.

G. P. Srivastava—Attended the All India Museum Conference, Lucknow.

J. C. Srivastava—Attended the 3rd All India Museum Conference, Lucknow.

R. S. Tiwari—*Goubinispora*—An indicator of Middle Triassic horizon in India. V International Palynological Conference, Cambridge.

Vishnu-Mittre—Vegetation history of the Early Pleistocene in the Kashmir Valley. V International Palynological Conference, Cambridge, U. K.

Vishnu-Mittre—The climatic interpretation of palynological patterns. V International Palynological Conference, Cambridge, U. K.

Vishnu-Mittre—Quaternary palaeobotany/palynology in the Himalaya. XI Himalayan Geology Seminar, Wadia Institute of Himalayan Geology, Dehradun.

Vishnu-Mittre and A. Bhattacharya—Vegetation and climate during the late glaciation in Ladakh. V International Palynological Conference, Cambridge, U. K.

## Lectures given outside the Institute

P. K. Maithy—Early life and problems—Seminar on Morphology, ecology and taxonomy—at Acharya Narendra Dev College, Kanpur.

G. K. B. Navale—Lignite Microscopy—at Association of Engineers and Scientists, Neyveli Lignite Corporation, Neyveli.

Vishnu-Mittre—Patterns of vegetational change in the Quaternary of India—at French Institute, Pondicherry.

—Palaeobotanical history of crops—at Centre for Theoretical Studies, Indian Institute of Science, Bangalore.

—Crops in space and time—at Botany Department, Bangalore University.

—How were the remains of Pentoxyleae discovered? —at Botany Department, Bangalore University.

—Recent progress in Quaternary research—at Department of Ancient History, Culture and Archaeology, Allahabad University.

—The environmental factors in the rise and fall of cultures—at Department of Ancient History, Culture and Archaeology, Allahabad University, Allahabad.

## Conferences/Workshops/Meetings sponsored by the Institute

1. Workshop on 'Cenozoic stratigraphy and palynology in India' organized by Indian Association of Palynostratigraphers, Lucknow—October 23-25, 1980.
2. Third Indian Botanical Congress, organised by Botany Department, Lucknow University—December 25-30, 1980.
3. Fortysixth Annual Meeting of the Indian Academy of Sciences, Lucknow—November 14-16, 1980.

## Training Provided to Outsiders

1. Shrimati Anusuya Bhattacharya (Geological Survey of India, Lucknow) was imparted training in Mesozoic palynostratigraphy and on methodology in Quaternary palynology.
2. Shri H. R. Ganesan (Meteorological Office, Pune) was trained on inference of past climates for pollen analytical studies.
3. Kumari Rekha Pant (Botany Department, Allahabad University), Kumari Chetna Mandavia and Kumari Rekha Dodia (Physical Research Laboratory, Ahmedabad) were imparted training in modern as well as in Quaternary palynology.

## Technical Assistance to Outsiders

CENTRAL MINING, PLANNING AND DESIGNING INSTITUTE OF COAL INDIA LIMITED, RANCHI :

Correlation of the coal seams, the biopterological study and rank determination of 19 Raniganj coal pellets from two bore holes were completed and the utilization prospects of these coals were assessed (B. K. Misra).

NEYVELI LIGNITE CORPORATION :

Biopetrological evaluation of lignites from four lateral sections of Main Seam was done in order to suggest improved utilization of the lignite for specific purposes (B. K. Misra).

INTERNATIONAL COMMISSION OF COAL PETROLOGY :

Different types of vitrinite macerals in Indian coals were critically assessed for International Nomenclature Standardisation (B. K. Misra).

GEOLOGICAL SURVEY OF INDIA :

Twelve samples from bore hole RMU-12 located in Nirsa Area, Raniganj Coalfield were palynologically dated. Two miofloras were demarcated, viz., Upper Karharbari and Lower Barakar.

Samples from bore hole PBK-1 from Palar Basin were analysed and Lower Gondwana and Upper Gondwana miofloras were recorded. The samples of bore hole GCN-27 from Chinoor Area, GRK-1 from Jeyapuram Area and GGK-20 from Ramagundum Area, Godavari Valley Coalfield were analysed and Lower Karharbari to Raniganj miofloras were demarcated (Suresh C. Srivastava).

Bore hole samples from RNM-Series were palynologically dated (R. S. Tiwari).

Dr. Kumari Veena Chandra (Botanical Survey of India) consulted herbarium specimens on Cyperaceae.

Shri N. B. Singh (Botanical Survey of India) consulted material on Crassulaceae.

Archaeological Survey of India, Archaeology Department, Allahabad University, Physical Research Laboratory, Ahmedabad and Geological Survey of India.

The materials sent by them were investigated or identified and the results have been communicated (Vishnu-Mittre).

Bose Institute, Calcutta ; Archaeological Survey of India ; Deccan College, Pune ; Anthropology Department, University of Massachusetts, U.S.A.; Geological Survey of India ; and Wadia Institute of Himalayan Geology, Dehradun.

Charcoal samples from Burzahom, Kashmir and the peat, sediment and archaeological samples sent by the above organisations were dated.

NATIONAL INSTITUTE OF OCEANOGRAPHY, GOA :

To determine the ages of storm beaches, storm cycles and coral reefs the grab core samples have been dated.

## Deputation/Training/Study abroad

M. N. BOSE

Attended the 1st International Palaeobotanical Conference, held at Reading (U. K.) during 10th-11th July, 1980. He also attended the VII African Congress in Micropalaeontology at the National Museum of Natural History, Paris during 18th-19th July, 1980. Under the INSA—Royal Society Exchange Programme he went to U. K. and visited Reading University and British Museum of Natural History, London.

R. N. LAKHANPAL

Attended the V International Palynological Conference held at Cambridge, U. K. from 29th June to 6th July, 1980 and the 1st International Palaeobotanical Conference held at Reading on 10th-11th July, 1980.

D. C. BHARADWAJ

Participated in the meeting of the Scientific Committee of the International Geological Correlation Programme (IGCP) at UNESCO Headquarter, Paris, France from 16th to 20th February, 1981.

VISHNU-MITTRE

Attended the V International Palynological Conference held at Cambridge, U. K. Three papers were also presented by him in the conference.

R. S. TIWARI

Worked at Senckenberg Museum, Frankfurt a. m., West Germany as Alexander von Humboldt Foundation Senior Fellow from March to December, 1980. He also visited the Palynological Laboratories at Krefeld, Wien and Budapest.

# Publication and Information Section

## PUBLICATION

Manuscripts of Volume 27, numbers 1 and 2 of The Palaeobotanist were sent to Press. Corrected galley-proofs have also been returned to the printer.

Volumes 28-29 of The Palaeobotanist have also been sent to Press for type casting and printing. These two volumes shall comprise 42 contributions.

The twentyseventh Sir Albert Charles Seward Memorial Lecture 'Some aspects of bioclimatology and vegetation of Peninsular India' delivered by Prof. V. M. Meher-Homji was published during the year.

The twentyeighth lecture 'Present trends in ecological studies' delivered by Prof. P. Legris has also been processed for publication.

The ninth Birbal Sahni Memorial Lecture 'Geological evolution of Uttar Pradesh' by Prof. R. C. Misra was sent for publication.

During the period under review the tenth lecture entitled 'The Palms' delivered by Prof. M. S. Chennaveeraiah was processed for publication.

The ninth Silver Jubilee Commemoration Lecture 'Application of experimental taxonomy to horticultural botany' by Dr. T. N. Khoshoo was processed for publication.

Volume II of IV International Palynological Confernece Proceedings was published during the year. It comprises all symposia and non-symposia papers of Division II and III.

The printing of Volume III was taken up and nearly half of the Volume has been printed. Separates of printed articles have been distributed.

Hindi and English versions of Annual Reports for 1979-1980 were published.

During the year an income of Rs. 51,729.05 was registered from the sale proceeds of the Institute publications. The sum includes the following foreign exchange earnings.

US $ = 3,502.47
£ = 122.10

## LIBRARY

The following statements show the details of stock for the year under review :

| Serial number | Details | Position on 31-3-80 | Addition during 1980-81 | Total |
|---|---|---|---|---|
| 1. | Books .. | 3476 | 82 | 3558 |
| 2. | Journals .. | 7127 | 80 | 7207 |
| 3. | Reprints .. | 25299 | 1132 | 26431 |
| 4. | Microfilms/Cards | 221 | 22 | 243 |
| 5. | Theses .. | 29 | 5 | 34 |
| 6. | Reports .. | 40 | 1 | 41 |
| 7. | Maps & Atlas | 42 | 1 | 43 |
| 8. | Reference Books | 108 | 10 | 118 |

In addition to this 83 current periodicals were also subscribed. Total registered numbers—102.

**2. Exchange Programme :**

| | | |
|---|---|---|
| (i) | Number of papers whose reprints were purchased for exchange .. .. .. .. | 75 |
| (ii) | Total number of reprints sent out on exchange .. | 2260 |
| (iii) | Number of institutions on exchange .. .. | 68 |
| (iv) | Number of individuals on exchange .. .. | 345 |
| (v) | Sets of papers of Prof. Sahni distributed .. | 3 |
| (vi) | Number of periodicals received on exchange .. | 85 |

**3. Current Awareness Service :**

A monthly list of new additions to the Library, e. g. books, reprints and journals as well as titles called from the journals was introduced in order to help the readers to keep in touch with the latest acquisitions. A copy of each issue was distributed to each Head of the Department.

4. In addition to the Scientific staff of the Institute the Library services were availed by a number of scientists from various organisations/institutions. Some of the important Universities/institutions/organisations are : Botany Department, Lucknow University, Lucknow ; Central Drug Research Institute, Lucknow ; Christ Church College, Kanpur ; Geology Department, Lucknow University, Lucknow ; Kumaun University, Naini Tal ; National Botanical Research Institute, Lucknow ; North Eastern Hill University, Shillong ; Punjab University, Chandigarh ; and Shivaji University, Kolhapur.

## Museum

### A-1. Exhibition Hall (1 & 2)

Most of the panels and show cases were renovated and rearranged. A few better fossil specimens were added to the display.

### A-2. Fossil Store (Hall No. 3)

As the storage hall in the basement became 'flooded' due to seepage of underground water, orders were received to shift the store to ground floor in the Herbarium Hall. This work has been started.

### B. Type & Figured specimens/slides

Specimens/slides/negatives pertaining to the 35 research papers were submitted. The position of type and figured specimens as on 31.3.81 is as under :

| | |
|---|---|
| Type and figured specimens .. .. .. | 1985 |
| Type and figured slides .. .. .. | 7331 |
| Negatives of type and figured specimens/slides .. | 6338 |

### C. Cataloguing of Type and Figured specimens

Cataloguing of Type and Figured specimens of megafossils was continued. Cards of the published papers between Museum Statement No. 101-308 were prepared.

**D. New collections from India**

Two hundred ninetyseven localities were visited by the Institute staff for the collection of megafossils and palynological samples. The details of collection by different departments are as under:

| | | |
|---|---|---|
| Precambrian Biology & Palaeozoic Palaeobotany Department .. .. | 1113 | |
| Mesozoic Palaeobotany Department .. | 2172 | |
| Cenozoic Palaeobotany department .. | 544 | |
| Quaternary Palynology Department .. | 510 | Samples |
| Coal Palaeobotany Department .. .. | 261 | ,, |
| Oil Palynology Department .. .. | 675 | ,, |

**Collections from abroad**

| | |
|---|---|
| From U. K., France and Nigeria were brought by the Director of the Institute for Museum .. .. .. | 22 |

**E. Presentation/Gift of fossil specimens**

Fossil samples were gifted to the following :

1. Head Department of Botany, Shivaji University, Vidyanagar, Kolhapur.
2. Teacher Incharge, Bejoy Narain Mahavidyalaya, Itachuna, Hooghly.
3. The Scientific Officer, Department of Atomic Energy, Atomic Mineral Division, Hyderabad.
4. Sri G. S. Pandey, Godda, Bihar.
5. Prof. J. C. Ahluwalia, I.I.T., New Delhi.
6. Shri V. M. Kelkar, D.S.T., New Delhi.

**F. Visitors during the year**

Visitors to the Museum included delegates attending the 3rd Indian Botanical Conference, 3rd Annual Meeting of the Indian Academy of Sciences, and IAP Workshop on Cenozoic Stratigraphy and Palynology. Foreign visitors came from Bangla Desh, Pakistan, Russia, United States of America and West Germany.

Students from following 11 colleges/universities of the country visited the Museum :

1. University of Gorakhpur, U. P.
2. Vikram University, Ujjain, M. P.
3. Banaras Hindu University, Varanasi, U. P.
4. K. V. College, Armapur, Kanpur, U. P.
5. Chandra Shekhar Azad University of Agriculture, Kanpur, U. P.
6. Raghu Nath Girls College, Meerut, U. P.
7. University of Jodhpur, Jodhpur, Rajasthan.
8. Tata College, Chaibasa, Bihar.
9. Garhwal University, Srinagar, U. P.
10. Behrampur University, Behrampur, Orissa.
11. Bhagalpur University, Bhagalpur, Bihar.

## Herbarium

Following additions were made during the year:

| Specimens | Additions | Total as on 31.3.1981 |
|---|---|---|
| Herbarium sheets .. | 56 | 10,561 |
| Fruits and seeds .. | 6 | 1,824 |
| Woods .. .. | 82 | 3,218 |
| Wood slides .. | 144 | 2,007 |
| Pollen slides .. .. | 67 | 10,167 |

Routine work such as aquisition of new material, tentative identifications, label writing, indexing, incorporation and registration, poisoning and repairing of specimens, issue and return of the herbarium material, loans to sister organisations and exchange of materials was carried out.

Pteridophytic specimens were re-arranged in a new workable system as followed at CNH, Botanical Survey of India, Howrah.

Gymnospermic specimens were re-arranged by following the system in use at Forest Research Institute, Dehradun. *Cycas* and *Ginkgo biloba* were added to the collection.

Confirmation, correction, modification, etc. of the identification of a number of specimens were done. Indexing of families Rubiaceae and Rutaceae was completed.

Seeds and fruits, collected earlier by Quaternary Department, were identified. Eight hundred and fifty new Index Cards were prepared for the carpothek.

## $^{14}C$ Laboratory

A new scalar unit was constructed in the laboratory to replace the older unit. The display of circuits in the new unit has LEDs in place of the Nixies.

## Garden

Decaying plants, including some of the roses, were removed and were replaced by new ones. Two types of ornamental plants were planted in alternate rows in the Chakra. About 30 plants of *Bougainvilleas* were propagated by means of grafting. Forty plants of *Bougainvilleas*, 25 of *Jatropha*, 15 of *Hibiscus*, 29 of *Magnolia* and some Cacti were presented by Dr M. N. Bose for the garden. Many varieties of *Canna* were also introduced. Prof. Sahni's Samadhi was repaired and the marble stones were polished.

## Founder's Day Celebrations

On 14th November, 1980, the Birthday of Professor Birbal Sahni, F.R.S. was celebrated.

In the morning at 9.00 a.m. the wreaths and flowers were placed on the Samadhi of Professor Birbal Sahni. In the evening at 5.30 p.m. the function started and the tenth Birbal Sahni Memorial Lecture titled "The Palms" was delivered by Prof. M. S. Chennaveeraiah, Department of Botany, Karnatak University, Dharwad.

On 15th November, 1980 at 5.30 p.m. Prof. P. Legris, Director de Recherch, C.N.R.S. Institut Francais, Pondicherry delivered the 28th Sir Albert Charles Seward Memorial Lecture titled "Present trends in ecological studies".

Shri S. N. Talukdar, Director, Institute of Petroleum Exploration, Oil and Natural Gas Commission. Dehradun delivered the 10th Silver Jubilee Commemoration Lecture entitled "The role of palaeobotany in oil exploration" on 16th November, 1980 at 5.30 p.m.

## Distinguished Visitors

1. Shri Vishwanath Pratap Singh, Chief Minister, U. P.
2. Prof. M. G. K. Menon, F.R.S., Secretary, Department of Science and Technology, New Delhi.
3. Dr. Maria Feutress, New Delhi.
4. Dr. Robert Meader, U.S.A.
5. Shri Geoferry Leach, New Delhi.
6. Shri Nelson Chichaya, Zimbabwe.
7. Dr Shrimati V. Puri, Meerut.
8. Prof. V. B. Singh, Tata Institute of Fundamental Research, Bombay.
9. Dr. D. N. Pachadzhanav, Dushanee, U.S.S.R.
10. Dr. P. Legris, Institute Francais, Pondicherry.
11. Prof. N. Balakrishnan Nair, Trivandrum.
12. Prof. D. V. S. Jain, Chandigarh.
13. Prof. M. S. Kanungo, Varanasi.
14. Prof. J. C. Ahluwalia III, New Delhi.
15. Lt. Col. Dei Chand.
16. Shri M. A. Rahman, Bangla Desh.
17. Prof. L. Bensher, Moscow, U.S.S.R.
18. Shri Ahmad Ali Khan, Pakistan.
19. Shrimati T. L. Pongestchler, West Germany.
20. Shri C. L. Chandrakar, Union Minister of State for Tourism, New Delhi.

# The Staff

(as on 1.4.1980)

DIRECTOR

Dr K. R. Surange, M.Sc., Ph.D., (Lucknow), Ph.D. (Cantab), F.Pb.S., F.A.Sc., F.N.A. (up to April 30, 1980)

Dr M. N. Bose, M.Sc., Ph.D., F.Pb.S., Correspondent de l Arsom (w.e.f. May 5, 1980)

DEPUTY DIRECTORS

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

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

DEPARTMENT OF PRECAMBRIAN BIOLOGY AND PALAEOZOIC PALAEOBOTANY

Dr K. M. Lele, M.Sc., Ph.D., F.Pb.S. (Assistant Director)
Dr P. K. Maithy, M.Sc., Ph.D. (S.S.O.)
Dr Shrimati Shaila Chandra, M.Sc., Ph.D., F.L.S. (S.S.O.)
Dr A. K. Srivastava, M.Sc., Ph.D. (J.S.O.)
Dr Manoj Shukla, M.Sc., Ph.D. (S.S.A.)
Dr J. Mandal, M.Sc., Ph.D. (J.S.A.)
Dr M. N. V. Prasad, M.Sc., Ph.D. (On foreign service terms)
Shri Bijai Prasad, M.Sc. (Research Scholar)

DEPARTMENT OF MESOZOIC PALAEOBOTANY

Dr Sukh Dev, M.Sc. (Hons.), Ph.D. (Lucknow), Ph.D. (Reading) (S.S.O.)
Dr H. K. Maheshwari, M.Sc., Ph.D. (S.S.O.)
Dr Shyam C. Srivastava, M.Sc., Ph.D. (S.S.O.)
Dr Kumari Jayasri Banerji, M.Sc., Ph.D. (J.S.O.)
Dr Kumari Zeba-Bano, M.Sc., Ph.D. (S.S.A.)
Shri B. N. Jana, M.Sc. (J.S.A.)

DEPARTMENT OF CENOZOIC PALAEOBOTANY

Dr U. Prakash, M.Sc., Ph.D., F.Pb.S. (Assistant Director)
Dr N. Awasthi, M.Sc., Ph.D. (S.S.O.)
Dr Anil Chandra, M.Sc., Ph.D. (S.S.O.)

Dr M. B. Bande, M.Sc., Ph.D. (J.S.O.)
Dr K. Ambwani, M.Sc., Ph.D. (J.S.O.)
Dr J. S. Guleria, M.Sc., Ph.D. (S.S.A.)
Kumari C. Lalitha, M.Sc. (J.S.A.)
Dr S. D. Bonde, M.Sc., Ph.D. (J.S.A.) (on foreign service terms)
Shri R. R. Yadav, M.Sc. (Research Scholar)

DEPARTMENT OF QUATERNARY PALYNOLOGY

Dr Vishnu-Mittre, M.Sc., Ph.D. (Lucknow), Ph.D (Cantab) (Assistant Director)
Dr H. P. Gupta, M.Sc., Ph.D. (S.S.O.)
Dr Anand Prakash, M.Sc., Ph.D. (S.S.O.)
Dr Shrimati Chhaya Sharma, M.Sc., Ph.D. (J.S.O.)
Shri A. K. Saxena, M.Sc. (J.S.A.)
Shri A. Bhattacharya, M.Sc. (Research Scholar)
Kumari Chanchala, M.Sc. (Research Scholar)
Kumari Aruna Sharma, M.Sc. (Research Scholar)

DEPARTMENT OF COAL PALAEOBOTANY

Dr G. K. B. Navale, M.Sc., Ph.D., F.G.S., B.G.M.S., F.I.A.S. (S.S.O.)
Dr R. S. Tiwari, M.Sc., Ph.D. (S.S.O.)
Dr Suresh C. Srivastava, M.Sc., Ph.D. (S.S.O.)
Dr Shrimati Archana Tripathi, M.Sc., Ph.D. (J.S.O.)
Shri B. K. Misra, M.Sc. (S.S.A.)
Dr Shrimati Vijaya Singh, M.Sc., Ph.D. (J.S.A.)
Shri Rakesh Saxena, M.Sc. (J.S.A.)

DEPARTMENT OF OIL PALYNOLOGY

Dr H. P. Singh, M.Sc. (Hons.), Ph.D. (Assistant Director)
Dr K. P. Jain, M.Sc., Ph.D. (S.S.O.)
Dr R. K. Kar, M.Sc., Ph.D. (S.S.O.)
Dr Pramod Kumar, M.Sc., Ph.D. (S.S.O.)
Dr R. K. Saxena, M.Sc., Ph.D. (J.S.O.)
Shri S. K. M. Tripathi, M.Sc. (J.S.A.)
Shri Rahul Garg, M.Sc. (J.S.A.)
Shri M. R. Rao, M.Sc. (J.S.A.)
Shri Samir Sarkar, M.Sc. (Research Scholar)

GEOCHRONOLOGY LABORATORY

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

PUBLICATION AND INFORMATION SECTION

Shri Jaswant Singh, M.Sc. (Assistant Editor)
Shri S. B. Verma, M.A., B.Com., D.P.A. (Publication Incharge).
Shri J. N. Nigam, B.A., B.Lib. Sc. (Librarian)

MUSEUM

Shri G. P. Srivastava, M.Sc. (Curator)
Shri N. C. Saxena, B.A. (Museum Assistant)

HERBARIUM

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

LABORATORY SERVICES

Shri H. N. Boral, B.Sc. (S.T.A.)
Shri B. Sekar, B.Sc. (S.T.A.)
Shrimati Asha Guleria, B.Sc. (J.T.A.)
Shrimati Madhabi Chakraborty, B.Sc. (J.T.A.)
Kumari Indra Kumari, B.Sc. (J.T.A.)
Shri D. C. Joshi, B.Sc. (J.T.A.)
Kumari Kamla Amarlal, B.Sc. (J.T.A.)
Shri N. K. Khasnavis, B.Sc., LL.B. (J.T.A.)
Shri T. K. Mandal, B.Sc. (J.T.A.)
Shri E. G. Khare, B.Sc. (J.T.A.)
Shri I. J. Mehra, B.A. (Lab. Assistant)
Shri A. K. Ghosh (Electrician)
Shri Mahipal Singh (Mechanic)
Shri Vijaya Singh Panwar (Glass Blower)
Shri P. S. Salujha (Mechanic)
Shri Bhim Singh (Mechanic-cum-Section cutter)
Shri Dhanpat (Mechanic-cum-Section cutter)

Shri Tulsi Ram (Herbarium Attendant)
Shri Mathura Dutt (Museum Attendant)
Shri Chhotey Lal (Laboratory Attendant)

PHOTOGRAPHY & DRAWING

Shri P. C. Roy (Photographer)
Shri Pramod Kumar Bajpai (Artist)

STORES

Shri Harjeet Singh, B.A. (Store Keeper)

ACCOUNTS SECTION

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

ADMINISTRATION

Shri Gurcharan Singh, M.A., LL.B. (Registrar)
Shri V. P. Gulati (Deputy Registrar—Stores)
Shri S. D. Mehtani (Deputy Registrar—Establishment)
Shri S. K. Suri (Stenographer)
Shri S. P. Chadha, B.A. (P.A. to Director)
Shri H. S. Srivastava, B.Com. (Office Assistant)
Shri Bhagwan Singh (Assistant)
Shrimati P. K. Srivastava (Receptionist)
Shri I. J. S. Bedi (U.D.C.)
Shri Ramesh Chandra (U.D.C.)
Shri R. K. Kapoor (L.D.C.)
Shrimati V. Nirmala (L.D.C.)

DRIVERS

Shri Hanuman Prasad
Shri Lallaln Prasad
Shri Balbir Singh

GENERAL HELP

Shri Sarju Prasad (Daftari)
Shri Roop Chand (Peon)

Shri Raja Ram (Peon)
Shri Sia Ram (Peon)
Shri Satruhan (Peon)
Shri Sant Ram (Peon)
Shri Sunder Lal (Peon)
Shri Bashir (Peon)
Shri Ram Sajeevan (Peon)
Shri Prem Chand (Peon)
Shri Prem Shankar (Chowkidar)
Shri Ram Dhari (Chowkidar)
Shri Vishnu Kumar (Chowkidar)
Shri Ram Deen (Chowkidar)
Shri Kesho Ram (Chowkidar)
Shri Ram Sahai (Mali-Skilled)
Shri Bipat (Mali-Skilled)
Shri Chaitu (Mali-Skilled)
Shri Rameshwar Prasad Pal (Mali-Unskilled)
Shri Chhange Lal (Safaiwala)
Shri Nanhoo (Safaiwala)
Shri Mewa Lal (Safaiwala)
Shri Ram Kishan (Safaiwala)
Shri Prem Chand (Safaiwala)
Shri Kali Deen (Chowkidar)

## Appointment and Promotions

Dr M. N. Bose, M.Sc., Ph.D., F.Pb.S., Correspondent de'l Arsom was appointed as the Director of the Institute w.e.f. 5th May, 1980.

DEPARTMENT OF PRECAMBRIAN BIOLOGY AND PALAEOZOIC PALAEOBOTANY

1. Dr Manoj Shukla, S.S.A., appointed as Junior Scientific Officer w.e.f. 16th March, 1981.
2. Shri Rupendra Babu, M.Sc., appointed as Junior Scientific Assistant w.e.f. 1st November, 1980.
3. Shri Kamaljeet Singh, M.Sc., appointed as Junior Scientific Assistant w.e.f. 27th March, 1981.
4. Kumari Rajni Misra, M.Sc., appointed as Research Scholar w.e.f. 17th March, 1981.

## DEPARTMENT OF MESOZOIC PALAEOBOTANY

1. Dr B. N. Jana, J.S.A., appointed as Senior Scientific Assistant w.e.f. 30th September, 1980.
2. Shri P. K. Pal, Research Scholar, appointed as Junior Scientific Assistant w.e.f. 4th July, 1980.
3. Shri R. S. Singh, M.Sc., appointed as Junior Scientific Assistant w.e.f. 24th November, 1980.
4. Shri V. B. Srivastava, M.Sc., appointed as Research Scholar w.e.f. 28th November, 1980.
6. Shrimati Rashmi Srivastava, M.Sc., appointed as Junior Scientific Assistant w.e.f. 16th March, 1981.

## DEPARTMENT OF CENOZOIC PALAEOBOTANY

1. Shrimati V. Lalitha, J.S.A., appointed as Senior Scientific Assistant w.e.f. 30th September, 1980.
2. Shri R. R. Yadav, Research Scholar, appointed as Junior Scientific Assistant w.e.f. 4th July, 1980.
3. Kumari Madhu Ahuja, M.Sc., appointed as Junior Scientific Assistant, w.e.f. 16th March, 1981.
4. Shri R. C. Mehrotra, M.Sc., appointed as Research Scholar w.e.f. 25th November, 1980.

## DEPARTMENT OF QUATERNARY PALYNOLOGY

1. Shri A. K. Saxena, J.S.A., appointed as Senior Scientific Assistant w.e.f. 30th October, 1980.
2. Shri A. Bhattacharya, J.S.A., appointed as Senior Scientfiic Assistant w.e.f. 30th September, 1980.
3. Kumari Aruna Sharma, Research Scholar, appointed as Junior Scientific Assistant w.e.f. 6th January, 1981.
4. Kumari Chanchala, Research Scholar, appointed as Junior Scientific Assistant w.e.f 13th June, 1980.
5. Dr Shrimati Asha Khandelwal, M.Sc., Ph.D., appointed as Junior Scientific Assistant w.e.f. 16th March, 1981.
6. Shri P. M. Rao, M.Sc., appointed as Junior Scientific Assistant w.e.f. 31st March, 1981.

DEPARTMENT OF COAL PALAEOBOTANY

1. Dr Shrimati Vijaya Singh, J.S.A., appointed as Senior Scientific Assistant w.e.f. 30th September, 1980.
2. Shrimati Neerja Jha, Research Scholar, appointed as Junior Scientific Assistant w.e.f. 8th January, 1981.
3. Shri Ram Avtar, M.Sc., appointed as Junior Scientific Assistant w.e.f. 6th November, 1980.
4. Kumari Alpana Agarwal, M.Sc., appointed as Junior Scientific Assistant w.e.f. 17th March, 1981.
5. Shri O. S. Sarate, M.Sc., appointed as Junior Scientific Assistant w.e.f. 27th March, 1981.

DEPARTMENT OF OIL PALYNOLOGY

1. Shri S. K. M. Tripathi, J.S.A., appointed as Senior Scientific Assistant w.e.f. 30th September, 1980.
2. Shri Rahul Garg, J.S.A., appointed as Senior Scientific Assistant, w.e.f. 30th September, 1980.
3. Shri M. R. Rao, J.S.A., appointed as Senior Scientific Assistant w.e.f. 30th September, 1980.
4. Shri Samir Sarkar, Research Scholar, appointed as Junior Scientific Assistant w.e.f. 30th September, 1980.
5. Kumari Rekha Chauhan, M.Sc., appointed as Research Scholar w.e.f. 4th December, 1980.

PUBLICATION AND INFORMATION SECTION

1. Shri Jaswant Singh, Assistant Editor, appointed as Joint Editor w.e.f. 14th August, 1980.
2. Shri G. K. Gupta, B.Sc., B.Lib. Sc., appointed as Library Assistant w.e.f. 1st August, 1980.
3. Kumari Kavita Sangal, B.Sc., B.Lib. Sc., appointed as Library Assistant w.e.f. 4th August, 1980.
4. Kumari T. P. Lalithamma appointed as Lower Division Clerk w.e.f. 18th March, 1981.

MUSEUM

Shri B. D. Mandaokar, B.Sc., appointed as Junior Museum Assistant w.e.f. 11th November, 1980.

LABORATORY SERVICES

1. Shri K. B. Gupta, B.Sc., appointed as Junior Lab Assistant w.e.f. 7th July, 1980.
2. Kumari Sangita Rastogi, B.Sc., appointed as Junior Lab Assistant w.e.f. 3rd October, 1980.
3. Shri A. K. Srivastava, B.Sc., appointed as Junior Lab Assistant w.e.f. 3rd October, 1980.
4. Kumari Reeta Chatterjee, B.Sc., appointed as Junior Lab Assistant w.e.f. 6th October, 1980.
5. Shri Keshav Ram, B.Sc., appointed as Junior Lab Assistant w.e.f. 6th October, 1980.
6. Shri Chandra Pal, B.Sc., appointed as Junior Lab Assistant w.e.f. 14th October, 1980.
7. Shri Prem Prakash, B.Sc., appointed as Junior Lab Assistant w.e.f. 4th July, 1980.

STORES

Kumari G. Omanayamma appointed as Stenotypist w.e.f. 3rd January, 1981.

ADMINISTRATION

1. Kumari Ruchita Bagchi appointed as Lower Division Clerk w e.f. 11th April, 1980.
2. Srimati Usha Chandra appointed as Telephone Operator w.e.f. 26th September, 1980.
3. Kumari P. Varghese appointed as Lower Division Clerk w.e.f. 31st January, 1981.
4. Shri Joseph George, appointed as Lower Division Clerk w.e.f. 3rd February, 1981.
5. Shri S. K. Srivastava appointed as Lower Division Clerk w.e.f. 3rd February, 1981.
6. Shri S. K. Bagchi appointed as Lower Division Clerk w.e.f. 4th February, 1981.

GENERAL HELP

1. Shri Ram Singh appointed as Peon w.e.f. 4th November, 1980.

2. Shri Rajendra Kumar appointed as Peon w.e.f. 4th November, 1980.
3. Shri K. C. Chandola appointed as Peon w.e.f. 4th November, 1980.
4. Shri Sri Ram appointed as Peon w.e.f. 10th November, 1980.
5. Shri Haradhan Mahanti appointed as Peon w.e.f. 10th November, 1980.
6. Shri Bishnu Datt appointed as Chowkidar w.e.f. 16th December, 1980.
7. Shrimati Munni appointed as Safaiwali w.e.f. 5th November, 1980.

PROMOTIONS

1. Shri Sia Ram Peon promoted as Duplicating Machine Operator w.e.f. 2nd April, 1980.
2. Shri Raja Ram, Peon, promoted as Lab Attendant w.e.f. 17th September, 1980.
3. Shri Satruhan, Peon, promoted as Lab Attendant w.e.f. 17th September, 1980.
4. Shri Sunder Lal, Peon, promoted as Lab Attendant w.e.f. 23rd October, 1980.

## Retirements

1. Dr K. R. Surange, Director, on 30th April, 1980.

## Obituaries

1. Dr Keshav Mukund Lele (24th March, 1931—9th January, 1981), Assistant Director and Head, Department of Precambrian Biology and Palaeozoic Palaeobotany. Served the Institute for 23 years, 5 months and 23 days.
2. Chhotey Lal (16th June, 1922—14th November, 1980), Laboratory Attendant. Served the Institute for 29 years, 7 months and 13 days.

# Committees

## FINANCE & BUILDING COMMITTEE

*Chairman*

Prof. T. S. Mahabale, F.N.A.,
Maharashtra Association for the Cultivation of Science,
Law College Road, Pune 411 004

*Members*

The Secretary,
Department of Science & Technology,
Technology Bhavan, New Mehrauli Road,
New Delhi 110 029

Joint Secretary (Finance),
Department of Science & Technology,
Technology Bhavan, New Mehrauli Road,
New Delhi 110 029

Shri Sardar Hussain,
Superintending Engineer, 25th Circle, U.P. P.W.D.,
Lucknow 226 001

Shri Arun Kumar,
Architect,
118, Cantonment Road, Lucknow 226 001

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

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

## SCIENTIFIC PROGRAMMING & EVALUATION COMMITTEE

*Chairman*

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

*Members*

Prof. F. Ahmad, F.N.A.
Commissioner for Geology & Mining, J. & K.,
Srinagar 190 001

Prof. A. R. Rao,
No. 2, XI Main Road, 3rd Block, East Jayanagar,
Bangalore

Prof. Rama,
Tata Institute of Fundamental Research,
Bombay 400 005

Dr Sunirmal Chanda,
Bose Institute,
Calcutta-700 009

Dr R. N. Lakhanpal,
Deputy Director

Dr D. C. Bharadwaj,
Deputy Director

Dr Vishnu-Mittre,
Head, Quaternary Palynology Department

Dr Uttam Prakash,
Head, Cenozoic Palaeobotany Department

Dr H. P. Singh,
Head, Oil Palynology Department

Dr G. K. B. Navale,
Head, Coal Palaeobotany Department

Dr Sukh-Dev,
Head, Mesozoic Palaeobotany Department

Dr P. K. Maithy,
Head, Precambrian Biology & Palaeozoic
Palaeobotany Department

Dr G. Rajagopalan,
Head, Geochronology Laboratory

## RESEARCH CORE COMMITTEE

Dr M. N. Bose,
Director

Dr R. N. Lakhanpal,
Deputy Director

Dr D. C. Bharadwaj,
Deputy Director

## MANAGING COMMITTEE

Dr M. N. Bose, Director
Dr R. N. Lakhanpal
Dr D. C. Bharadwaj
Dr Vishnu-Mittre
Dr Uttam Prakash
Dr H. P. Singh
Dr G. K. B. Navale
Dr Sukh-Dev
Dr P. K. Maithy

## BUILDING & GARDEN COMMITTEE

Dr R. K. Kar, Convener
Dr A. K. Srivastava
Shri S. D. Mehtani

## CANTEEN COMMITTEE

Dr Sukh-Dev, Chairman
Dr Anand-Prakash
Shri N. K. Khasnavis
Kumari Indra Kumari
Shri S. K. Suri
Shri Bhagwan Singh

## HERBARIUM COMMITTEE

Dr N. Awasthi, Convener
Dr H. P. Gupta
Dr H. A. Khan

LIBRARY COMMITTEE

Dr H. K. Maheshwari, Convener
Dr Suresh C. Srivastava
Dr M. B. Bande

MAINTENANCE COMMITTEE

Dr K. P. Jain, Convener
Dr Shyam C. Srivastava
Dr K. Ambwani
Shri V. P. Gulati

MUSEUM COMMITTEE

Dr Shrimati Shaila Chandra, Convener
Dr Anil Chandra
Dr Pramod Kumar
Shri G. P. Srivastava

PROCUREMENT & QUALITY CONTROL COMMITTEE

Dr G. K. B. Navale, Convener
Dr Sukh-Dev
Dr Anand-Prakash
Shri Ghanshyam Singh
Shri V. P. Gulati

STORES & PURCHASE COMMITTEE

Dr M. N. Bose
Dr R. N. Lakhanpal
Dr D. C. Bharadwaj
Shri Gurcharan Singh
Shri Ghanshyam Singh
Shri V. P. Gulati

VEHICLE & GUEST HOUSE COMMITTEE

Dr Shyam C. Srivastava

R. N. KHANNA & COMPANY,
*Chartered Accountant*

*Branch :*
6, Newal Kishore Road,
Lucknow 226 001

3, Kabir Marg,
Clay Square,
Lucknow 226 001

## AUDITORS REPORT OF BIRBAL SAHNI INSTITUTE OF PALAEOBOTANY, LUCKNOW

We have audited the annexed Balance Sheet on BIRBAL SAHNI INSTITUTE OF PALAEOBOTANY, LUCKNOW as at 31st March, 1981 and also the relevant Income and Expenditure Account and Receipt and Payment Account for the year ended on that date with the help of account and vouchers relating thereto.

We report that to the best of our information and according to the explanation given to us, in our opinion, the Balance Sheet read with notes thereon, shows a true and correct state of affairs of the Institute as at 31st March, 1981 and the Income & Expenditure Account gives a true and fair view of income over expenditure.

*For* R. N. KHANNA & COMPANY,
*Chartered Accountants*

(Sd.)
(R. N. KHANNA)
*Partner*

**Seal**

R. N. KHANNA & COMPANY
*Chartered Accountant*

*Branch :*
6, Newal Kishore Road,
Lucknow 226 001

3, Kabir Marg
Clay Square
Lucknow 226 001

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**Notes on Balance Sheet of Birbal Sahni Institute of Palaeobotany, Lucknow as at 31st March, 1981**

1. Rs.1,65,000/- out of Central recurring Grant was transferred to Central non-recurring Grant ;

2. During the year, the following capital assets were created out of recurring grants :

| | Rs. |
|---|---|
| Books & Journals .. .. | 9,156.08 |
| Works & Building .. .. | 10,809.57 |
| Maps & Topo Sheets .. .. | 187.54 |
| TOTAL .. | 20,153.19 |

3. 'Petrol Minibus' created out of donated fund from Rajasthan Scheme (Sponsored by University of Wisconsin was sold for Rs. 14,198.72. The sales proceeds was credited to capital fund account and the cost of Petrol Minibus Rs. 35,904.10 was reduced from the said assets and donated fund account.

4. No depreciations are provided on fixed assets. The fixed assets are shown at cost in the Balance Sheet.

5. The Institute accounts are maintained on cash basis.

*For* R. N. KHANNA & COMPANY,
*Chartered Accountant*

(Sd.)
(R. N. KHANNA)
*Partner*

**Seal**

# *Statement of Accounts for the Year 1980-81*

## Birbal Sahni Institute of

**Balance Sheet as**

| LIABILITIES | Amount Rs. | Amount Rs. | Amount Rs. |
|---|---|---|---|
| **Capital Fund :** | | | |
| Balance as per Last Balance Sheet .. | | 57,41,244.16 | .. |
| *Add :* Government of India Grants on Capital Account .. | | 11,00,000.00 | .. |
| Plan Recurring Grant transferred for Capital Expenditure .. | | 1,65,000.00 | .. |
| Recurring Expenditure used for creating Fixed Assets: | | | |
| Books & Journals .. | 9,156.08 | .. | .. |
| Maps & Topo Sheets | 187.54 | .. | .. |
| Works & Building .. | 10,809.57 | 20,153.19 | .. |
| Sale Proceeds of Petrol Minibus .. | | 14,198.72 | 70,40,596.07 |
| **Reserve and Surplus :** | | | |
| Excess of Revenue Grant over Revenue Expenditure .. | | | 1,98,961.67 |
| **Donated Funds/Grants:** | | | |
| Cost of Land donated by U.P. Govt. .. | | 32,292.00 | |
| Founder's Donation | | 1,52,500.00 | |

## Palaeobotany, Lucknow

**on 31st March, 1981**

| ASSETS | Amount Rs. | Amount Rs. |
|---|---|---|
| **Fixed Assets :** | | |
| Land (Donated by Govt. of U. P.) .. .. .. | | 32,292.00 |
| **Works & Buildings :** | | |
| As per Last Year's Balance Sheet | 15,90,168.81 | |
| Additions during the year : | | |
| Out of Capital Account .. | 1,25,673.66 | |
| Out of Revenue Account .. | 10,809.57 | 17,26,652.04 |
| **Research Apparatus & Equipment:** | | |
| As per Last Year's Balance Sheet | 15,54,354.02 | |
| Additions during the year .. | 51,661.17 | 16,06,015.19 |
| **Workshop Equipment** .. | | 67,374.85 |
| **Office and Miscellaneous Equipment :** | | |
| As per Last Year's Balance Sheet | 1,00,415.71 | |
| Additions during the year (Photography) .. .. .. | 27,506.35 | 1,27,922.06 |
| **Establishment of C-14 Laboratory :** | | |
| As per Last Year's Balance Sheet | 7,81,050.72 | |
| Additions during the year .. | 30,782.89 | 8,11,833.61 |
| **Plant and Machinery** | | |
| As per Last Year's Balance Sheet .. | 2,49,202.42 | |
| Additions during the year .. | 1,11,829.50 | 3,61,031.92 |

| LIABILITIES | Amount Rs. | Amount Rs. | Amount Rs. |
|---|---|---|---|
| C. D. Pant Memorial Fund .. .. | | 1,626.88 | |
| C. L. Katiyal Memorial Fund .. | | 3,561,08 | |
| P. C. Bhandari Memorial Fund .. | | 2,648.05 | |
| A. C. Seward Memorial Fund .. | | 10,033.58 | |
| Other Misc. Donations .. .. | | 10,421.29 | |
| M. G. T. Scheme (C.S.I.R.) .. | | 8,100.79 | |
| Coal Scheme (C.S.I.R.) | | 7,784.66 | |
| Palynological Scheme (C.S.I.R.) .. | | 5,207.87 | |
| UNESCO Aid Fund.. | | 19,629.75 | |
| Burmah Oil Co. Donation .. | | 1,900.00 | |
| Rajasthan Scheme (sponsored by Univ. of Wisconsin) .. | 58,913.25 | | |
| *Less* value of petrol Minibus sold out .. | 35,904.10 | 23,009.15 | |
| Gift in kind : | | | |
| Humboldt Foundation (West Germany) | | 75,000.00 | |
| P. K. Srivastava Memorial Fund .. | | 2,780.00 | |

| ASSETS | Amount Rs. | Amount Rs. |
|---|---|---|
| **Apparatus and Equipment (Donated) :** | | |
| M.G.T. Scheme (C.S.I.R.) .. | 7,155.79 | |
| Burmah Oil Co. .. .. | 700.00 | |
| Founder's Donation .. .. | 2,500.00 | |
| Coal Scheme (C.S.I.R.) .. | 6,645.29 | |
| Palynological Scheme (C.S.I.R.) .. | 5,207.87 | |
| Rajasthan Scheme (Sponsored by Univ. of Wisconsin) .. .. | 21,138.90 | |
| UNESCO Aid Equipment .. | 19,629.75 | |
| Humboldt Foundation (West Germany) .. .. .. | 75,091.50 | 1,38,069.10 |
| **Vehicle :** | | |
| As per Last Year's Balance Sheet .. | 1,20,577.99 | |
| Additions during the year .. | 90,014·18 | |
| | 2,10,592.17 | |
| *Less* Petrol Minibus sold out (—) | 35,904.10 | 1,74,688.07 |
| **Furniture and Fixtures :** | | |
| As Per Last Year's Balance Sheet .. | 6,06,552.95 | |
| Additions during the year .. | 47,590.58 | 6,54,143.53 |
| **Furniture and Fixtures** (*Donated*) | | |
| Burmah Oil Company .. | 1,200.00 | |
| M. G. T. Scheme (C.S.I.R.) .. | 945.00 | |

| LIABILITIES | Amount Rs. | Amount Rs. | Amount Rs. |
|---|---|---|---|
| Birbal Sahni Research Award Endowment .. .. | | 15,000.00 | 3,71,495.10 |
| | | | 11,30,510.51 |
| **General Provident Fund/ Contributory Provident Fund :** | | | |
| **Current Liabilities and Provisions :** | | | |
| Security and Earnest Money Deposits .. | | | 25,460.23 |
| Loans and Advances to Employees .. | | | 3,07,688.00 |
| Total C/o .. | | | 90,74,711.58 |

| ASSETS | Amount Rs. | Amount Rs. |
|---|---|---|
| Coal Scheme (C.S.I.R.) | 1,139.37 | |
| Rajasthan Scheme (Sponsored by University of Wisconsin) .. | 979.70 | 4,264.07 |
| **Books & Journals :** | | |
| As per Last Year's Balance Sheet | 2,78,818.15 | |
| Additions during the year— | | |
| Out of capital Account .. | 48,493.29 | |
| Out of Revenue Account .. | 9,156.08 | 3,36,467.52 |
| **Founder's Library** | | |
| (*Donated*) .. .. .. | | 50,000.00 |
| **Founder's Fossil Collection** | | |
| (*Donated*) .. .. .. | | 50,000.00 |
| **Maps and Topo Sheets :** | | |
| As per Last Year's Balance Sheet | 12,593.28 | |
| Additions during the year .. | 187.54 | 12,780.82 |
| **Investments** | | |
| (*Donation Account*) : .. .. | | 45,000.00 |
| **UNESCO Book Coupons** .. | | 793.02 |
| **Cash and Bank Balances :** | | |
| Cash in Hand (Imprest Account) .. | 244.40 | |
| Current account with State Bank of India .. .. | 9,94,423.21 | 9,94,667.61 |

| LIABILITIES | Amount Rs. | Amount Rs. | Amount Rs. |
|---|---|---|---|
| Total B/F .. | | | 90,74,711.58 |
| Grand Total .. | | | 90,74,711.58 |

**Auditors' Report**

As per our attached report of even date.

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

(Sd.) R. N. KHANNA (Partner)

*Place :* Lucknow
*Dated:* 6th July, 1981

| ASSETS | Amount Rs. | Amount Rs. |
|---|---|---|
| **Loans and Advances :** | | |
| Unsettled Advances Plan Rev. Account .. .. .. | 24,548.46 | |
| Unsettled Advances Plan Cap. Account .. .. | 4,05,957.85 | |
| Unsettled Advances Non-Plan Rev. Account .. .. | 12,011.35 | 4,42,517.66 |
| **Advance to Employees :** | | |
| House Building Advance .. | 2,38,440.00 | |
| Festival Advance .. .. | 9,560.00 | |
| Conveyance Advance .. .. | 59,688.00 | 3,07,688.00 |
| **General Provident Fund/ Contributory Provident Fund :** | | |
| Investments .. .. | 9,00,000.00 | |
| Advances out of G.P.F. .. | 1,38,330.00 | |
| Insurance out of G.P.F. .. | 26,657.00 | |
| With State Bank of India .. | 65,523.51 | 11,30,510.51 |
| Grand Total .. .. | | 90,74,711.58 |

(Sd.) Ghanshyam Singh
*Accounts Officer*

(Sd.) Gurcharan Singh
*Registrar*

(Sd.) M. N. Bose
*Director*

## Birbal Sahni Institute of

### Income and Expenditure Account

| EXPENDITURE | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| **Academic Expenses :** | | | |
| To pay & allowance of Academic Staff .. | 90,261.80 | 9,23,984.85 | 10,14,246.65 |
| To Field Excursion .. | 29,856.60 | 24,747.30 | 54,603.90 |
| To Remuneration of Birbal Sahni Professor | 3,000.00 | .. | 3,000.00 |
| To Symposium & Seminar on Recent Advances in Cryptogamic Botany .. | 12,856.81 | .. | 12,856.81 |
| **To Honorarium to Lecturers :** | | | |
| For Birbal Sahni Mem. Lecture .. | .. | 350.00 | 350.00 |
| For Silver Jubilee Comm. Lecture .. | .. | 350.00 | 350.00 |
| **To International Programme :** | | | |
| Deputation Abroad .. | 4,946.56 | 53,326.22 | 58,272.78 |
| **To Expenses of Services Ancillary to Research :** | | | |
| To Pay & Allowance of Auxi. Technical Staff .. .. | 38,694.33 | 3,03,162.73 | 3,41,857.06 |
| To Chemicals & Glasswares, Photo Goods & Small Apparatus, etc. .. | 31,956.65 | 1,46,616.52 | 1,78,573.17 |

## Palaeobotany, Lucknow

**for the year ending 31st March, 1981**

| INCOME | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| **Balance of Last Year's Grant of Revenue Account allowed for Expenditure during the Current year** .. | 93,964.68 | 2,02,992.42 | 2,96,957.10 |
| **By Grants from Govt. of India Revenue Account** .. | 5,00,000.00 | 25,00,000.00 | 30,00,000.00 |
| **By Grant from U. P. Govt. on Revenue Account** .. .. | .. | 5,000.00 | 5,000.00 |
| **By Sale proceeds of Priced Publications :** | | | |
| The Palaeobotanist | .. | 37,135.24 | 37,135.24 |
| Monograph .. | .. | 11,145.75 | 11,145.75 |
| Symposium & Spl. Publication .. | .. | 1,406.79 | 1,406.79 |
| Seward Memorial Lecture .. | .. | 314.99 | 314.99 |
| Birbal Sahni Memorial Lecture .. | .. | 211.88 | 211.88 |
| Silver Jubilee Mem. Lecture .. | .. | 163.00 | 163.00 |
| Picture Post Cards | .. | 396.25 | 396.25 |
| Catalogue of Indian Fossil Plants .. | .. | 955.15 | 955.15 |
| IV I.P.C. Proceedings | .. | 21,013.88 | 21,013.88 |

| EXPENDITURE | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| To Library Requirements .. | .. | 18,523.03 | 18,523.03 |
| To Herbarium Requirements .. | .. | 548.90 | 548.90 |
| To Museum Requirements .. .. | 527.29 | 7,373.68 | 7,900.97 |
| To Maintenance of Apparatus & Equipment & Workshop Machinery .. | 19,968.30 | .. | 19,968.30 |
| **To Publication Expenses :** | | | |
| "The Palaeobotanist" | .. | 88,436.12 | 88,436.12 |
| Spl. Pub. by Prof. T. S. Sadasivan .. | 753.51 | .. | 753.51 |
| Birbal Sahni Memorial Lecture .. | .. | 216.34 | 216.34 |
| Annual Report .. | .. | 6,175.16 | 6,175.16 |
| Seward Memorial Lecture .. | .. | 1,894.51 | 1,894.51 |
| Silver Jubilee Lecture | .. | 865.00 | 865.00 |
| Publication of I.P.C. Proceedings .. | .. | 13,726.74 | 13,726.74 |
| **Travelling & Other Allowances :** | | | |
| For Governing Body, Scientific Programmes & Evaluation Committee and Selection Committee meetings | 3,259.31 | 23,514.92 | 26,774.23 |

| INCOME | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| **By Miscellaneous Receipts and Recoveries :** | | | |
| Vehicle Charges .. | .. | 28.30 | 28.30 |
| By Telephone Charges | .. | 1,978.40 | 1,978.40 |
| By V. S. Room Charges .. .. | .. | 150.00 | 150.00 |
| By Application Fees | .. | 3,781.00 | 3,781.00 |
| Miscellaneous Receipts and Recoveries .. | 5,150.90 | 4,087.50 | 9,238.40 |
| Recovery of Conveyance Advance .. | .. | 15,509.00 | 15,509.00 |
| Interest on Conveyance Advance .. | .. | 1,692.45 | 1,692.45 |
| Recovery of Festival Advance .. | .. | 14,160.00 | 14,160.00 |
| Recovery of Natural Calamity Advance .. | .. | 11,000.00 | 11,000.00 |
| Recovery of House Bldg. Advance .. | .. | 43,900.00 | 43,900.00 |
| Pension Contribution | .. | 947.00 | 947.00 |
| Interest on House Bldg. Advance .. | .. | 1,087.92 | 1,087.92 |
| Employees Insurance Scheme .. | 1,011.00 | 5,908.50 | 6,919.50 |
| Total .. | 6,00,126.58 | 28,84,965.42 | 34,85,092.00 |

| EXPENDITURE | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| For attending Scientific meetings & Conferences in India and for other Purposes .. | 16,674.25 | 55,374.77 | 72,049.02 |
| For Reimbursement of Medical Expenses .. | 703.12 | 19,001.82 | 19,704.94 |
| For Over Time Allowance .. | 4.10 | 1,847.34 | 1,851.44 |
| For Leave Travel Concession .. | 74.40 | 6,915.11 | 6,989.51 |
| For Reimbursement of Tuition Fees .. | 96.00 | .. | 96.00 |
| For Children Edu. Allowance .. | .. | 752.00 | 752.00 |
| **To Pensionary Expenses:** | | | |
| To Superannuation Allowance and Pension | .. | 1,45,987.06 | 1,45,987.06 |
| Payment under Insurance Scheme .. | .. | 5,000.00 | 5,000.00 |
| G.P.F. Interest .. | .. | 63,042.76 | 63,042.76 |
| C.P.F. Contribution | .. | 5,160.00 | 5,160.00 |
| **To General Expenses :** | | | |
| To Pay & Allowance of Administrative Staff .. | 49,197.50 | 3,65,614.76 | 4,14,812.26 |
| To Telephone & Trunk Call Charges.. | .. | 19,907.60 | 19,907.60 |
| To Postage .. | .. | 22,852.22 | 22,852.22 |

| INCOME | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| Total B/F | 6,00,126.58 | 28,84,965.42 | 34,85,092.00 |
| Total | 6,00,126.58 | 28,84,965.42 | 34,85,092.00 |

| EXPENDITURE | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| To Advertisement Charges .. | 2,899.75 | 38,629.83 | 41,529.58 |
| To Hot & Cold Weather Charges .. | .. | 4,920.00 | 4,920.00 |
| To Petrol & Mobil Oil | 2,026.78 | 8,614.07 | 10,640.85 |
| To Electricity Charges | 21,289.74 | 43,962.28 | 65,252.02 |
| To Municipal Taxes | .. | 11,993.18 | 11,993.18 |
| To Insurance of Vehicles & Library | .. | 4,444.40 | 4,444.40 |
| To Uniform to the Staff .. | 2,085.40 | 6,938.55 | 9,023.95 |
| To Printing & Stationery .. | 10,166.36 | 34,771.47 | 44,937.83 |
| To Custom Duty & Port Trust Charges | .. | .. | .. |
| To Railway Ft. & Carriage .. | .. | 3,277.55 | 3,277.55 |
| To Entertainment All. to Director .. | .. | 2,945.91 | 2,945.91 |
| To Miscellaneous & Unforeseen .. | 14,857.98 | 44,585.40 | 59,443.38 |
| **To Maintenance Expenses :** | | | |
| To Building .. | .. | 10,681.64 | 10,681.64 |
| To Garden .. | .. | 4,979.40 | 4,979.40 |
| To Vehicles .. | 9,892.98 | 6,053.42 | 15,946.40 |
| To Repairs & Renewals | .. | 10,193.32 | 10,193.32 |
| To Petty Construction | 19,018.23 | 3,823.17 | 22,841.40 |

| INCOME | | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|---|
| Total B/F | .. | 6,00,126.58 | 28,84,965.42 | 34,85,092.00 |
| Total | .. | 6,00,126.58 | 28,84,965.42 | 34,85,092.00 |

| EXPENDITURE | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| **To other Expenses:** | | | |
| To Deposits Refunded .. | .. | 500.00 | 500.00 |
| To Medical Advice | .. | 400.00 | 400.00 |
| To Audit Fees .. | .. | 1,500.00 | 1,500.00 |
| To Legal Advice .. | .. | 1,260.00 | 1,260.00 |
| **To Welfare Expenses :** | | | |
| Financial Assistance to Departmental Canteen .. | .. | 4,659.37 | 4,659.37 |
| To Festival Advance | .. | 14,980.00 | 14,980.00 |
| To Conveyance Advance.. .. | .. | 30,000.00 | 30,000.00 |
| To House Building Advance.. .. | .. | 97,200.00 | 97,200.00 |
| **To Govt. of India Scholarship Expenses:** | .. | 19,482.16 | 19,482.16 |
| **To amount transferred to C. N. R. Account** .. .. | 1,65,000.00 | .. | 1,65,000.00 |
| **Excess of Income over Expenditure :** .. | 50,058.83 | 1,48,902.84 | 1,98,961.67 |
| Grand Total .. | 6,00,126.58 | 28,84,965.42 | 34,85,092.00 |

(Sd.) Ghanshyam Singh
*Accounts Officer*

(Sd.) Gurcharan Singh
*Registrar*

| PAYMENT | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| Total B/F | 6,00,126.58 | 28,84,965.42 | 34,85,092.00 |
| Grand Total .. | 6,00,126.58 | 28,84,965.42 | 34,85,092.00 |

**Auditor's Report**

As per our report on the Balance Sheet of even date.

(Sd.) M. N. Bose
*Director*

For R. N. KHANNA & Co.,
*Chartered Accountant*
(Sd.) R. N. Khanna (Partner)

## Birbal Sahni Institute of

### Receipt and Payment for the

| RECEIPTS | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| **To Opening Balance :** | | | |
| **Bank Account :** | | | |
| Non-Plan Revenue Account .. | .. | 1,97,213.51 | 1,97,213.51 |
| Plan Revenue Account | 93,964.68 | .. | 93,964.68 |
| Plan Capital Account | 4,39,261.91 | .. | 4,39,261.91 |
| Donation Account .. | .. | 522.73 | 522.73 |
| IV I.P.C. Account | .. | 5,448.63 | 5,448.63 |
| **Cash Account :** | | | |
| Non-Plan Revenue Account .. .. | .. | 330.28 | 330.28 |
| **To Govt. of India Grants on Capital Account :** .. | 12,65,000.00 | .. | 12,65,000.00 |
| **To Govt. of India Grants on Revenue Account :** .. | 5,00,000·00 | 25,00,000.00 | 30,00,000.00 |
| **To Govt. of U.P. Grant on Recurring Account :** .. | .. | 5,000.00 | 5,000.00 |
| **To Sale Proceeds of Publications :** | | | |
| The Palaeobotanist | .. | 37,135.24 | 37,135.24 |
| Monograph .. | .. | 11,145.75 | 11,145.75 |
| Symposium .. | .. | 1,406.79 | 1,406.79 |
| Catalogue .. | .. | 955.15 | 955.15 |

## Palaeobotany, Lucknow

**Period 1.4.1980 to 31.3.1981**

| PAYMENT | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| **Capital Account :** | | | |
| **By Works and Building ..** | 1,13,266.21 | .. | 1,13,266.21 |
| **By Res. App. & Equipments ..** | 1,13,777.92 | .. | 1,13,777.92 |
| **By Equip. for Services Ancillary to Research :** | | | |
| Library .. | 61,148.36 | .. | 61,148.36 |
| Photography .. | 27,506.35 | .. | 27,506.35 |
| C-14 Laboratory .. | 3,45,592.89 | .. | 3,45,592.89 |
| Plant & Machinery | 1,11,829.50 | .. | 1,11,829.50 |
| **By Furniture & Fixtures : ..** | 47,590.58 | .. | 47,590.58 |
| **By Vehicles ..** | 92,014.18 | .. | 92,014.18 |
| **By Refund of Grants to Govt. :** | | | |
| Out of Capital Grants .. | .. | .. | .. |
| Out of Deposit Account .. | .. | .. | .. |
| **Revenue Account :** | | | |
| **By Pay and Allowances :** | | | |
| Pay (Academic) .. | 49,849.34 | 6,02,594.76 | 6,52,444.10 |

| RECEIPTS | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| Seward Memorial Lecture .. | .. | 314.99 | 314.99 |
| Birbal Sahni Mem. Lecture .. | .. | 211.88 | 211.88 |
| Picture Post Cards | .. | 396.25 | 396.25 |
| Silver Jubilee Comm. Lecture .. | .. | 163.00 | 163.00 |
| IV I.P.C. Proceedings | .. | 21,013.88 | 21,013.88 |
| **To Administrative Receipts :** | | | |
| Income Tax .. | 110.00 | 49,163.00 | 49,273.00 |
| Insurance Premium (S. S. Scheme) .. | 3,281.28 | 41,956.86 | 45,238.14 |
| C.T.D. Post Office .. | 50.00 | 7,040.00 | 7,090.00 |
| G.P.F. Subscription | 9,756.00 | 1,67,669.00 | 1,77,425.00 |
| Recovery of G. P. F. Advance .. | 5,575.00 | 93,322.00 | 98,897.00 |
| Recovery of B.S.I.P. Credit Co-op. Society | 3,441.21 | 29,084.80 | 32,526.01 |
| C.D.S. from R.P.F. Commissioner, Kanpur | .. | 37,077.51 | 37,077.51 |
| **To Misc. Receipts & Recoveries :** | | | |
| Application Fees .. | .. | 3,781.00 | 3,781.00 |
| V. S. Room Rent .. | .. | 150.00 | 150.00 |
| Telephone Charges .. | .. | 1,978.40 | 1,978.40 |
| Vehicle Charges .. | .. | 28.30 | 28.30 |
| Pension Contribution | .. | 947.00 | 947.00 |

| PAYMENT | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| Pay (Auxillary Technical) .. | 18,898.08 | 1,64,615.08 | 1,83,513.16 |
| Pay (Administrative) | 26,595.33 | 2,00,099.94 | 2,26,695.27 |
| D. A. & Additional D.A. .. .. | 64,229·20 | 4,82,698.87 | 5,46,928.07 |
| House Rent Allowance .. | 14,172.59 | 1,06,165.53 | 1,20,338.12 |
| City Comp. Allowance .. | 4,409.09 | 36,588.16 | 40,997.25 |
| Children Education Allowance .. | — | 752.00 | 752.00 |
| Over Time Allowance .. .. | 4.10 | 1,847.34 | 1,851.44 |
| Medical Reimbursement .. .. | 703.12 | 190,01.82 | 1,970.944 |
| Reimb. of Tuition Fees .. .. | 96.00 | .. | 96.00, |
| Leave Travel Concession .. | 74.40 | 7,468.11 | 7,542.51 |
| **By Travelling Allowance :** | | | |
| Governing Body & Selection Committee Meetings .. | 3,259.31 | 23,514.92 | 26,774.23 |
| For Attending Meetings and Conferences in India .. | .. | 4,280.30 | 4,280.30 |
| For Other Purposes | 16,674.25 | 51,094.47 | 67.768.72 |

| RECEIPTS | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| Other Miscellaneous Receipt .. | 5,150.90 | 4,087.50 | 9,238.40 |
| **To Recoveries of Loans & Advances :** | | | |
| Recovery of Festival Advance.. .. | .. | 14,160.00 | 14,160.00 |
| Recovery of Conv. Advance.. .. | .. | 15,509.00 | 15,509.00 |
| Interest on Conv. Advance .. .. | .. | 1,692.45 | 1,692.45 |
| Recovery of Flood Advance.. .. | .. | 11,000.00 | 11,000.00 |
| Recovery of House Bldg. Advance .. | .. | 43,900.00 | 43,900.00 |
| Interest on House Bldg. Advance .. | .. | 1,087.92 | 1,087.92 |
| **To Deposits :** | | | |
| Employees Insurance Scheme .. | 1,011.00 | 5,908.50 | 6,919.50 |
| Security Deposits .. | 25,460.23 | .. | 25,460.23 |
| **To Donation and Endowments :** | | | |
| Proceeds of Securities Matured .. | .. | 23,398.15 | 23,398·15 |
| **To Misc. Receipts on Capital Account :** | | | |
| Sale Proceeds of Mini Bus .. .. | 14,198.72 | .. | 14,198.72 |
| Total C/o .. | 23,66,260.93 | 33,34,199.47 | 57,00,460.40 |

| PAYMENT | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| **By Maintenance of Property :** | | | |
| For Building .. | .. | 10,681.64 | 10,681.64 |
| For Garden .. | .. | 4,979.40 | 4,979.40 |
| For Equipment & Apparatus .. | 19,968.30 | .. | 19,968.30 |
| For Vehicles .. | 9,892.98 | 6,053.42 | 15,946.40 |
| For Repairs & Renewals .. | .. | 10,193.32 | 10,193.32 |
| For Petty Construction .. .. | 19,018.23 | 4,403.17 | 23,421.40 |
| **By Contingencies :** | | | |
| By Telephone & Trunk Call Charges | .. | 19,907.60 | 19,907.60 |
| For Postage .. | .. | 22,852.22 | 22,852.22 |
| For Advertisement | 2,899.75 | 38,629.83 | 41,529.58 |
| For Hot & Cold Weather Charges .. | .. | 4,920.00 | 4,920.00 |
| For Petrol & Mobil Oil .. .. | 2,026.78 | 9,014.07 | 11,040.85 |
| For Electricity Charges .. | 21,289.74 | 43,962.28 | 65,252.02 |
| For Municipal Taxes | .. | 11,993.18 | 11,993.18 |
| For Insu. of Vehicles & Library .. | .. | 4,444.40 | 4,444.40 |
| For Liveries to the Staff .. | 2,085.40 | 6,938.55 | 9,023·95 |

| RECEIPTS | | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|---|
| Total B/F | .. | 23,66,260.93 | 33,34,199.47 | 57,00,460.40 |
| Total | .. | 23,66,260.93 | 33,34,199.47 | 57,00,460.40 |

| PAYMENT | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| For Printing & Stationery .. | 10,166.36 | 34,771.47 | 44,937.83 |
| For Railway Ft. & Carriage .. | .. | 3,277.55 | 3,277.55 |
| For Entertainment All. to Director .. | .. | 2,945.91 | 2,945.91 |
| For Misc. & Unforeseen .. | 14,857.98 | 44,585.40 | 59,443.38 |
| For Chemical & Glasswares .. | 34,956.65 | 1,47,616.52 | 1,82,573.17 |
| For Library Requirement .. | .. | 28,001.38 | 28,001.38 |
| For Herbarium Requirement .. | .. | 548·90 | 548.90 |
| For Museum Requirement .. | 939.75 | 7,373.68 | 8,313.43 |
| For Legal Advice .. | .. | 1,260.00 | 1,260.00 |
| For Medical Advice | .. | 400.00 | 400.00 |
| For Audit Fees .. | .. | 1,500.00 | 1,500.00 |
| **For Publications :** | | | |
| The Palaeobotanist | .. | 88,436.12 | 88,436.12 |
| Monograph on Glossopteris Flora" | .. | .. | .. |
| For Seward Memorial Lecture .. | .. | 1,894.51 | 1,894.51 |

| RECEIPTS | | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|---|
| Total B/F | .. | 23,66,260.93 | 33,34,199.47 | 57,00,460.40 |
| Total | .. | 23,66,260.93 | 33,34,199.47 | 57,00,460.40 |

| PAYMENT | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| For Annual Report .. | .. | 6,175.16 | 6,175.16 |
| For Birbal Sahni Mem. Lecture .. | .. | 216.34 | 216.34 |
| For Silver Jubilee Com. Lecture .. | .. | 865.00 | 865.00 |
| For IV I. P. C. Proceedings .. | .. | 13,726.74 | 13,726.74 |
| For Spl. Pub. by Birbal Sahni Professor .. | 753.51 | .. | 753.51 |
| **For Academic Expenses :** | | | |
| For Field Excursion | 50,992.60 | 24,747.30 | 75,739.90 |
| Birbal Sahni Mem. Lecture .. | .. | 350.00 | 350.00 |
| For Sir A. C. Seward Mem. Lecture .. | .. | 350.00 | 350.00 |
| For Silver Jubilee Lecture .. | .. | 350.00 | 350.00 |
| For Remuneration to Prof. T. S. Sadasivan .. | 3,000.00 | .. | 3,000.00 |
| Symposium & Seminar on Recent Advances in Cryptogamic Botany .. | 12,856.81 | .. | 12,856.81 |

| RECEIPTS | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| Total B/F | 23,66,260.93 | 33,34,199.47 | 57,00,460.40 |
| Total C/o | 23,66,260.93 | 33,34,199.47 | 57,00,460.40 |

| PAYMENT | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| **By International Programmes :** | | | |
| Air Passage for members of staff proceeding on Foreign fellowship or invited to attend Scientific Meetings and Conferences Abroad (Deputation Abroad) .. | 4,946.56 | 53,326.22 | 58,272.78 |
| **By Welfare Expenses:** | | | |
| Financial Assistance to Departmental Canteen .. | .. | 4,659.37 | 4,659.37 |
| **By G. P. F. Account:** | | | |
| G. P. F. Subscription transferred to G.P.F. Account .. | 9,756.00 | 1,67,669.00 | 1,77,425.00 |
| Recovery of Advance transferred to G.P.F. Account .. | 5,575.00 | 93,322.00 | 98,897.00 |
| G.P.F. Interest | | 63,042.76 | 63,042.76 |
| Institute Contribution to G.P.F. .. | .. | 5,160.00 | 5,160.00 |
| **By Miscellaneous :** | | | |
| Income Tax Remitted .. | 110.00 | 49,163.00 | 49,273.00 |
| Insurance Premium Remitted (S. S. Scheme) .. | 3,281.28 | 41,956.86 | 45,238.14 |

| RECEIPTS | | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|---|
| Total B/F | .. | 23,66,260.93 | 33,34,199.47 | 57,00,460.40 |
| Total C/o | .. | 23,66,260.93 | 33,34,199.47 | 57,00,460.40 |

| PAYMENT | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| C. T. D. Amount Remitted (Post Office) .. | 50.00 | 7,040.00 | 7,090.00 |
| B. S. I. P. Co-operative Credit Society .. | 3,441.21 | 29,084.80 | 32,526.01 |
| C.D.S. from R.P.F. Commissioner, Kanpur .. .. | .. | 37,077.51 | 37,077.51 |
| **By Govt. of India Senior Research Scholarship :** .. | .. | 19,482.16 | 19,482.16 |
| **By Loans and Advances :** | | | |
| Festival Advance | .. | 14,980.00 | 14,980.00 |
| Conveyance Advance | .. | 30,000.00 | 30,000.00 |
| House Building Advance .. | .. | 97,200.00 | 97,200.00 |
| Refunded to Kamal Book Binding House, Lucknow .. | .. | 500.00 | 500.00 |
| **By Investments :** | | | |
| Funds under Donation & Endowment Invested .. | .. | 22,500.00 | 22,500.00 |
| **By Pension and Superannuation :** | | | |
| Pension : Family Pension and Gratuity, etc. .. | .. | 1,45,987.06 | 1,45,987.06 |

| RECEIPTS | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| Total C/o .. | 23,66,260.93 | 33,34,199.47 | 57,00,460.40 |
| Grand Total .. | 23,66,260.93 | 33,34,199.47 | 57,00,460.40 |

**BALANCES**

| | Bank | Cash | Total |
|---|---|---|---|
| **Plan :** | | | |
| Central Recurring .. | 25,510.37 | .. | 25,510.37 |
| Central Non-Recurring | 8,31,194.87 | .. | 8,31,194.87 |
| **Non-Plan :** | | | |
| Central Recurring .. | 1,23,911.32 | 244.40 | 1,24,155.72 |
| Donation & Endowment .. .. | 1,070.88 | .. | 1,070.88 |
| IV I.P.C. Account .. | 12,735.77 | .. | 12,735.77 |
| Grand Total .. | 9,94,423.21 | 244.40 | 9,94,667.61 |

(Sd.) Ghanshyam Singh
*Accounts Officer*

(Sd). Gurcharan Singh
*Registrar*

(Sd.) M. N. Bose
*Director*

| PAYMENT | Plan Rs. | Non-Plan Rs. | Total Rs. |
|---|---|---|---|
| Payment under Insurance Scheme | .. | 5,000.00 | 5,000.00 |
| **By Transfer to Capital Account :** .. | 1,65,000.00 | .. | 1,65,000.00 |
| Grand Total .. | 15,09,555.69 | 31,96,237.10 | 47,05,792.79 |

**Auditor's Report**

As per our report on the Balance Sheet of the even date.

For R. N. KHANNA & Co.,
*Chartered Accountant*
(Sd.) R. N. KHANNA (*Partner*)

*Place : Lucknow*
*Dated : 6th July, 1981*