

Organisational Structure

GOVERNING BODY

Chairman

(w.e.f. 20.06.2000)

Professor Ashok Sahni

Dean of University Instructions &
Professor of Geology
Panjab University
Chandigarh 160 014

Members

Professor V.S. Ramamurthy,

Secretary or his Nominee
DST, Technology Bhavan
New Mehrauli Road
New Delhi 110 016

Dr H.K. Gupta,

Director
National Geophysical Research Institute
Uppal Road
Hyderabad 500 037

Shri Arun Sharma,

Joint Secretary
& Financial Adviser or his Nominee
DST, Technology Bhavan
New Mehrauli Road
New Delhi 110 016

Professor J.S. Singh

Department of Botany
Banaras Hindu University
Varanasi 221 005

†Professor D.D. Pant

106, Tagore Town
Allahabad 211 002

Professor Manju Banerjee (From 06.11.2001)

Department of Botany
Calcutta University
35, Ballygunge Circular Road
Kolkata 700 019

Members (Ex-officio)

Dr M. Sanjappa

Director
Botanical Survey of India
P-8, Brabourne Road
Kolkata 700 001

Shri Ravi Shanker / Dr P.C. Mondal

Director General
Geological Survey of India
27, Jawaharlal Nehru Road
Kolkata 700 016

Professor M.P. Singh

Department of Geology
Lucknow University
Lucknow 226 007

Member-Secretary (Ex-officio)

Professor Anshu Kumar Sinha,

Director,
Birbal Sahni Institute of Palaeobotany
Lucknow 226 007

Non-Member Assistant Secretary (Ex-officio)

Shri Suresh Chandra Bajpai,

Registrar,
Birbal Sahni Institute of Palaeobotany
Lucknow 226 007

RESEARCH ADVISORY COUNCIL

Chairman

(w.e.f. 01.10.2000)

Professor J.S. Singh

Department of Botany
Banaras Hindu University
Varanasi 221 005

Member-Convener (Ex-officio)

Professor Anshu Kumar Sinha,
Director,
Birbal Sahni Institute of Palaeobotany
Lucknow 226 007

Members

Dr K.R. Gupta
Adviser (ESS), DST
Technology Bhavan, New Mehrauli Road
New Delhi 110 016

Professor B.D. Sharma
Kathmandi
Narnaul 123 001

Professor I.B. Singh
Department of Geology
Lucknow University
Lucknow 226 007

Dr N.D. Mitra
49 D, Townshend Road
Bhawanipur
Kolkata 700 025

Professor S.N. Agashe
Department of Botany, Bangalore University
401, 41st Cross, 5th Block
Jayanagar, Bangalore 560 041

Professor Manju Banerjee
Department of Botany
Calcutta University
35, Ballygunge Circular Road
Kolkata 700 019

Shri Kuldeep Chandra
Executive Director, ONGC
KDM Institute of Petroleum Exploration
9, Kaulagarh Road
Dehradun 248 195

Professor P.K. Khare
Department of Botany
Allahabad University
Allahabad 211 002

Professor S.B. Bhatia
441, Sector 6
Panchkula 134 109

Member (Ex-officio)

Shri Ravi Shanker
Senior Dy. Director General
GSI, Northern Region, Sector 'E'
Aliganj, Lucknow 226 020

Non-Member Secretary (Ex-officio)

Shri Suresh Chandra Bajpai,
Registrar,
Birbal Sahni Institute of Palaeobotany
Lucknow 226 007

FINANCE & BUILDING COMMITTEE

Chairman (Ex-officio)

Professor Ashok Sahni
Chairman, Governing Body
Birbal Sahni Institute of Palaeobotany
Lucknow 226 007

Members

Shri Arun Sharma
Joint Secretary & Financial Adviser
or his Nominee, Department of Science and Technology,
Technology Bhawan,
New Mehrauli Road,
New Delhi 110 016

Professor M.P. Singh
Member, Governing Body
Birbal Sahni Institute of Palaeobotany

Shri V.P. Garg
71, Mall Avenue
Avas Vikas Colony
Lucknow 226 001

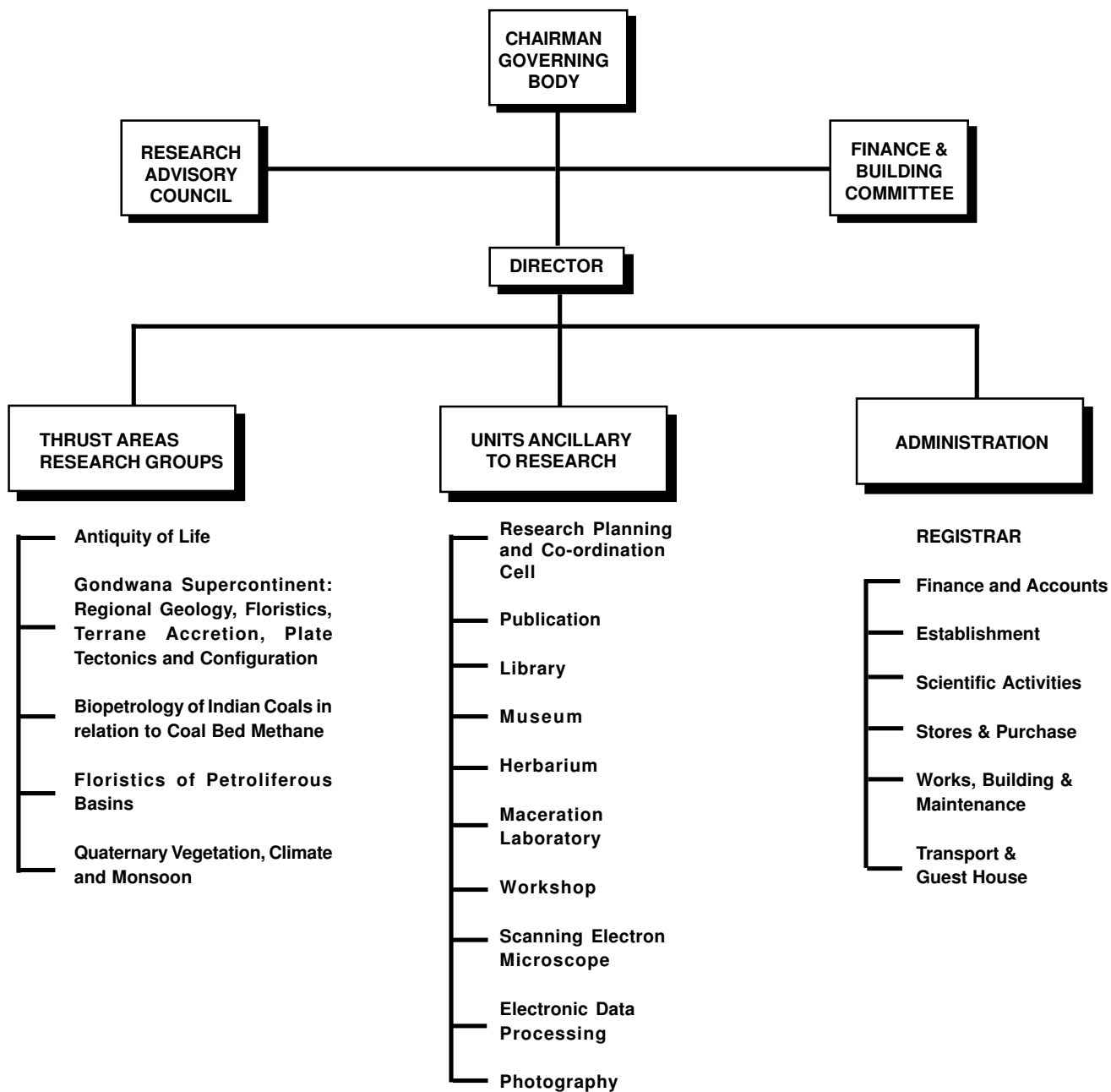
Member (Ex-officio)

Professor Anshu Kumar Sinha,
Director,
Birbal Sahni Institute of Palaeobotany
Lucknow 226 007

Non-Member Secretary (Ex-officio)

Shri Suresh Chandra Bajpai,
Registrar,
Birbal Sahni Institute of Palaeobotany
Lucknow 226 007

BSIP ORGANISATIONAL SET-UP



Research

Thrust Area: Antiquity of Life

Project 1: Palaeobiology and biostratigraphy of Precambrian Basin

Component 2: Morphotaxonomical studies of biological remains of both micro- and mega-fossils from the Meso/Neoproterozoic sediments of the Kurnool and Chhattisgarh

Reviewed carbonaceous mega remains from the Owk Shale Formation of Kurnool Basin. Presence of forms- *Longfengshania* and *Tawuia* indicates Neoproterozoic age for the beds. The microfossil remains comprise smooth walled acritarch (*Orygmato-sphaeridium*, *Protosphaeridium*) along with presence of *Obruchevella*, the Vendian marker element in the basin. Diversified remains of thallophytic algae are addition to the assemblage of microbial remains from the chert bed in Koilkuntala Limestone Formation (Kurnool Group) exposed near Nandikotkur in Kurnool District, A.P. Similar forms are known from the Late Proterozoic beds of China. Fresh collections of ichnofossils/dubiofossils from the Panium Quartzite Formation have also been studied. These forms grouped as- medusoid like form, algal mat texture and spindle-shaped forms, do not throw any light on the age. All these recorded forms have not proved to be of any help in demarcating the Precambrian/Cambrian boundary in Kurnool Basin.

Manoj Shukla & Mukund Sharma

Studied organic-walled microfossils (OWM) comprising acritarch and cyanobacterial remains for the

first time from the interbedded dark gray siltstone belonging to Chaporadih Formation of Chandarpur Group exposed in Kodar Nala near Tumgaon (Raipur District) and Dhansera Village (Sarangarh), Chhattisgarh. The small sized *Lieosphaeridia* and ornamented forms of acritarch belong to sphaeromorphida as well as a few processed forms of sphaerohystrichmorphida groups in the present assemblage. Cyanobacteria are represented by colonies of sphaeroidal cells and two types of trichomes. The recovered forms are mostly comparable with earlier reported forms. Vendian marker acritarchs are not present in the recovered assemblage. The OWM in assemblage suggest an early Neoproterozoic age.

Studied spindle-shaped ichnofossils from the sandstone bed showing animal activity comparable with modern annelids. The present forms are similar to forms earlier reported from other countries in equivalent beds. These forms are indicative of coastal shallow marine conditions. Analysis of the recovered assemblage both macro/microfossils indicates an early Neoproterozoic age for the Chandarpur Group.

R. Babu

Thrust Area: Gondwana Supercontinent: Regional Geology, Floristics, Terrane Accretion, Plate Tectonics and Configuration

Project 2: Floristics and biostratigraphy of Palaeozoic and Mesozoic of Himalayas

Component 1: Floristics and stratigraphy of the Late Palaeozoic and Mesozoic sediments of the Tethyan Himalaya and their regional relationship

Carried out integrated spores-pollen studies with the known faunal data from two sections around Laptal Camp in Malla Johar area. The study has helped in the

intergrated biostratigraphy of the Spiti Shale, which has been dated from Oxfordian to Berriasian in age.

Vijaya

Component 2: Permian plant fossils from North-Eastern Himalayas

Finalized the study on morphological and stratigraphical significance of floristic assemblages recovered from different localities of Arunachal Pradesh, Sikkim and Darjeeling. It has been observed that the Permian sediments of Arunachal Pradesh and Sikkim are mainly represented by the species of *Gangamopteris*, *Noeggerathiopsis* and *Glossopteris*, whereas, Darjeeling flora is essentially represented by the species of *Glossopteris* along with equisetalean genera of *Phyllothea* and *Schizoneura*. Comparison of the flora with Lower Gondwana formations of peninsular India suggests that *Gangamopteris*, *Noeggerathiopsis* association discovered in Arunachal and Sikkim areas is comparable with the Lower Barakar flora. The dominance of *Glossopteris* and presence of equisetals in Darjeeling coalfield is correlated with the Raniganj assemblage of peninsular India. The specific identification of *Glossopteris* leaves described by earlier workers is revised during the course of study.

The palynological assemblages of different localities of Permian sediments show poor recovery of spores and pollen in quality as well as in quantity. Quite often samples were treated for more than a month and many times repeated maceration had to be carried out for the recovery of spores-pollen. The mioflora of Darjeeling area shows the presence of *Striatites*, *Striatopodocarpites*, *Faunipollenites*, *Alisporites* and *Paravesicaspora*, which is comparable with the mioflora of Raniganj Formation. Arunachal and Sikkim assemblages represented by *Sahanites*, *Vikkipollenites*, *Striatrites*, *Diastriatites* and *Microbaculispora* suggest affiliation with the Lower Barakar mioflora.

A.K. Srivastava & A.P. Bhattacharyya

R. Tewari & A.K. Srivastava

Project 4: Floristics, biostratigraphy and palaeoenvironment of Gondwana sediments

Component 1: Morphotaxonomy, floristics, evolution, biostratigraphy and palaeo-environmental studies of Son-Mahanadi, Damodar, Panagarh and Birbhum basins

Completed identification of 200 impression and compression specimens from seven localities in the southern part of Mand-Raigarh Coalfield (Chhattisgarh). The identified species indicate Middle to Late Permian age (Barakar, Barren Measures and Kamthi formations) for the various beds. Photography of important taxa has been completed. Combined studies of fossil flora from both northern and southern parts of the coalfield are being finalised. The samples from all the localities were

macerated for recovery and study of megaspores, however, they proved barren.

Completed a monographic study on geology and palaeontology of Gondwana sequences of Ib-River Coalfield (Orissa) and their biostratigraphic significance based on the megaplant fossils from six locations falling in the districts of Jharsuguda, Sundergarh and Sambalpur. More than 900 megafossil samples belonging to Barakar and Kamthi formations have been identified, grouped and photographed. The complete megafloreal assemblage is

represented by 24 genera and 94 species belonging to Lycophyta, Equisetales, Sphenophyllales, Filicales, Cordaitales, Cycadales, Ginkgoales, Coniferales and Glossopteridales. The order Glossopteridales is highly diversified with 63 species. The Gondwana megafloora of the studied coalfield looks to be as diversified as that of Talcher Coalfield, the second coalfield of Mahanadi Basin.

S. Chandra & K.J. Singh

Analysed the coal-bearing and Kamthi sequences from three bore-holes TTB-7, TKL-1 and TSN-10 drilled in Talcher Coalfield. The palynoassemblages recorded from coal horizons show dominance of striated bisaccates followed by monosaccate taxa (*Densipollenites*) and are correlatable with the Upper Permian assemblages of Damodar Basin. However, in bore-hole TTB-7 (at 40.60-275.70 m) and TKL-1 (98.40-180.40 m) the stray occurrence of age marker taxa- *Arcuatipollenites*, *Playfordiaspora*, *Satsangisaccites* and *Falcisporites* impart a latest Permian affiliation. The strata above the coal horizon in TTB-7 (13.90-26.00 m) has yielded typical Early Triassic palynoflora having *Satsangisaccites*, *Falcisporites*,

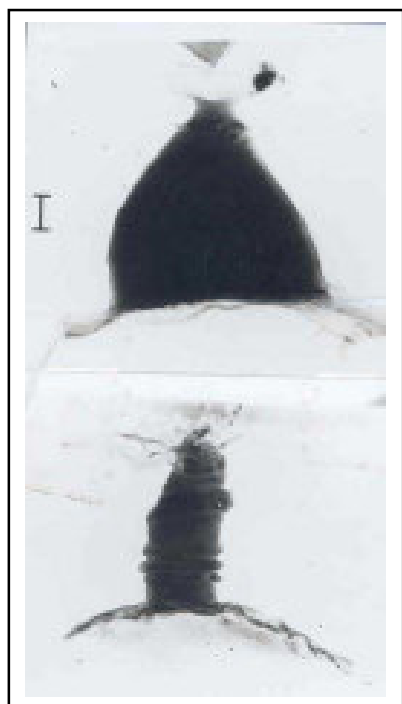
Alisporites, *Arcuatipollenites*, *Playfordiaspora*, *Goubinispora* and *Osmundacidites*. The report of palynological dating has been sent to Coal wing, Geological Survey of India. Visited Talcher Coalfield and collected samples (292) from bore-holes TSP-1, TSP-2, TTN-1 and TTB-10. The sequence here represents the coal bearing horizon and the Kamthi strata.

A. Tripathi

Completed spores-pollen study from 470 m thick subsurface Gondwana sediments in bore-hole DPD-6 drilled in Pachami area, West Bengal. This has helped in the age assessment of the three formational units- Rajmahal, Dubrajpur and Barakar. These three lithological units are palynologically dated as Early Cretaceous, Middle Jurassic and Late Permian in age, respectively. Compiled palynological data from the Panchet Formation Mesozoic succession in six bore-holes (PGD-1A, 2, 4, 6, 8 & 9A) of the Panagarh area, Damodar Basin (WB), to evaluate the biostratigraphic status of this lithological unit. The study has suggested that the Panchet Formation in the area has been deposited during Early Triassic to the end Jurassic. Visited (with Archana Tripathi) Raniganj Coalfield and collected bore core samples from two bore-holes- RRK-1 and RJS, which represent subsurface Gondwana sediments of Late Permian, Triassic and Early Cretaceous horizons.

Vijaya

Recorded two palynoassemblages in bore-hole MJB-1 drilled in Mand-Raigarh Coalfield (Chhattisgarh). The assemblage-I (at 220-385 m depth) of Late Early Permian age shows dominance of *Scheuringipollenites* and *Faunipollenites* in association with *Rhizomaspora* and *Ibisporites* indicating Upper Barakar palynofloral assemblage. The palynoassemblage-II (41-188 m) of Late Permian age reveal the prominence of *Striatopodocarpites* and *Faunipollenites*. The other taxa recorded in the assemblage are *Densipollenites*, *Verticipollenites*, *Arcuatipollenites* and *Guttulapollenites* with sporadic occurrence of *Trabeculosporites*. Three other palynoassemblages have also been identified in B.H. ROP-8 of the coalfield. Assemblage-I (357 m depth) of Late Early Permian age



Unique Organic remains. Scale bar = 10 microns.

shows dominance of *Scheuringipollenites*, *Parasaccites* and *Faunipollenites*, indicating Lower Barakar affinities. Assemblage-II (334-352 m) of Upper Permian age reveals the dominance of *Scheuringipollenites*, rare occurrence of *Barakarites* along with Upper Barakar assemblage. The youngest assemblage-III (69.70-262.50m) of Late Permian age shows the prominence of *Faunipollenites*, *Striatopodocarpites* and frequent occurrence of *Crescentipollenites* and *Arcuatipollenites*, besides *Gondisporites* and *Alisporites*. Bore holes and out crop samples have also been collected from Sohagpur and Mand Raigarh coalfields.

Ram-Awatar

Worked out samples from bore-hole SSM-1 (397.10m deep) of Mahuli Block, Chhattisgarh after initial palynodating for Coal Wing, GSI. The strata between 161.70 to 397.10 m has yielded Upper Permian palynoflora having dominance of *Striatopodocarpites* and subdominance of *Densipollenites* associated with

Crescentipollenites, *Striasulcites*, *Lacinitiletes* and *Brevitriteles*, etc. It is correlatable with the *Striatopodocarpites-Densipollenites* Palynozone of Tiwari & Tripathi (1988) and indicates Late Permian age. The assemblage at 19.27 to 152.40 m shows dominance of *Striatopodocarpites* in association with high frequency of *Arcuatipollenites*, *Satsangisaccites* and *Goubinispora*. Other taxa recorded are *Falcisporites*, *Playfordiaspora*, *Krempipollenites*, *Cyathidites*, *Tethysispora*, *Lundbladispota* and *Callumispota*. The composition suggests a late Early Triassic age.

Archana Tripathi & Vijaya

Undertook an excursion to Mand-Raigarh Coalfield, district Raigarh and collected more than 250 megafossil specimens belonging to *Glossopteris* flora from Barakar and Kamthi formations exposed in different Nala sections and collieries.

K.J. Singh

Component 2: Morphotaxonomy, floristics, evolution, biostratigraphy and palaeoenvironmental studies of Satpura and Wardha-Godavari basins

Compiled and synthesized the plant fossils data recorded from different collieries of Pench Valley Coalfield. The distribution of *Buriasdia*, *Gangamopteris*, *Noeggerathiopsis* and *Euryphyllum* in Rawanwara, Pench East and Thesgora collieries, belonging to lower seams of Barakar Formation, suggests floristic correlation with the Karharbari Formation, whereas, the presence of *Gangamopteris*, *Glossopteris*, *Noeggerathiopsis* in Sethia, Haranbatta, Kukurmunda, Shivpuri I and II and Mathani collieries indicates plant fossils of Upper Barakar seams, comparable with the flora of Lower Barakar Formation. The palaeobotanical investigation suggests that during Barakar time in Pench Valley Coalfield two distinct floral assemblages flourished in different climatic set up.

Completed the morphological studies of megaspores belonging to following genera: *Barakarella pantii*, *Bankisporites utkalensis*, *Bankisporites indicus*, *Bokarosporites rotundus*, *Duosporites congoensis*,

Duosporites multipunctatus, *Biharisporites spinosus*, *Talchirella trivedii* recovered from Rawanwara Khas and Pench East collieries. Two manuscripts dealing with new types of megaspores have been finalized.

A.K. Srivastava & Rajni Tewari

The investigation of Motur beds for the first time yielded a well preserved palynoflora, although quantitatively assemblage is poor but the presence of *Densipollenites* and striate disaccates indicates its comparison with Upper Barakar and Barren Measures assemblages.

A.K. Srivastava & Ram-Awatar

Compiled and finalized the palynological studies of samples from bore-hole MAB-1 drilled in Bottapagudem area, Chintalpudi sub-Basin. Compiled studies of Permian

palynoflora of India and Africa. Megaspores have been recovered from Late Permian sediments of Mailaram area. Identification is in progress.

Neerja Jha

Carried out palynological investigation on samples from bore-hole WB-4 of Bhatali Block in Chandrapur District (Maharashtra). Three palynoassemblages have been identified—*Densipollenites* dominant assemblage (at 141-149 m depth), *Corisaccites-Guttalapollenites* assemblage (194-436 m), and *Plicatipollenites* dominant assemblage (at 437 m). The Motur Formation, lithologically marked in the bore-hole, yielded *Corisaccites-Guttalapollenites* assemblage. Barakar palynoassemblage is absent. The palynoflora recorded from 141 to 341 m is comparable to Late Permian age, whereas Talchir palynoflora has been recorded from the

samples at 437 m. Palynological investigation has also been carried out on the material collected from Nanad, Makard Dogra and Phukeshwar in Nagpur District. Correlation and palynodating of coal seams and associated sediments at Nanad, Makard Dogra have been completed and new areas of extension of Wardha Valley coalfield have recently been explored. Three palynoassemblages have been recovered from three boreholes. The oldest being *Callumispora-Parasaccites* assemblage, succeeded by *Parasaccites-Callumispora* assemblage. These palynoassemblages are comparable to Karharbari Formation. *Scheuringipollenites* dominant assemblage, characteristic of Barakar Formation has also been recorded. Coal seams are palynologically correlated with of Karharbari age.

A.P. Bhattacharyya

Component 3: Ultrastructure of fossil cuticles and megaspores and comparative studies on selected modern taxa

SEM and TEM studies on the epicuticular waxy layer were carried out on a few taxa of Cretaceous pteridosperms and extant Cycadales for investigating the structural morphology of these surface deposits on cuticular membrane (CM). In the extinct taxa clusters of small irregular shaped patches of epicuticular waxes are seen. Exact structure of these waxes has been lost during diagenesis, whereas, in the extant species of *Zamia* the CM is covered by tubular wax structure showing distinctive forms. The densely arranged tubes covering leaf surface are short (0.6-1.2 μm) and cylindrical (0.2-0.3 μm in diameter). A significant proportion of these tubes lie partly embedded within the amorphous wax film. But the majority projects away from the epidermis.

Ultra-thin sections of dispersed biodegraded CM have shown tunneling microbial structures on inner side of the CM. The microbes while eating through the CM form tunnels, which are characteristic of specific bacteria. The tunnel contains characteristic bands or cross-walls at places in the direction of microbial movement. This decay is of unique type. Reported megaspores from the sandy shales associated with the coal seam exposed is shallow pits in the vicinity of Hahajor village, Godda District (Rajmahal Basin). Almost all the megaspores are of 'apiculate' type and represent the genera *Biharisporites* (2 spp.), *Jhariatriletes* and *Singhisporites* (1 sp. each).

Usha Bajpai

Project 5: Floristics, biostratigraphy and palaeoenvironment of Mesozoic sediments

Component 1: Morphotaxonomy, floristics, evolution, biostratigraphy and palaeoenvironmental studies of Triassic-Cretaceous flora of East-Coast Gondwana, Rajmahal and Gujarat basins

Carried out morphotaxonomic study of megafossils collected from Rajmahal Formation exposed at Mandro locality of Rajmahal Hills. The fossil assemblage includes—*Equisetites* sp., *Cladophlebis* sp., *Ptilophyllum cutchense*, *Pterophyllum princeps*, *Pterophyllum* sp., *Anomozamites fissus*, *Elatocladus confertus* and *Elatocladus* sp. In megafloral composition this assemblage seems to be coeval with the *Onthea* assemblage of second intertrappean bed of Rajmahal Basin. Finalised a paper on Araucarian remains from intertrappean cherts of Sonajori locality, evaluating morphological and anatomical features of different parts of female cones and associated araucarian root, woods, frond and a possible male cone.

Jayasri Banerji & B.N. Jana

Palynological analysis of samples from bore-hole RJSJ-2 (232.05 m deep) drilled in southern extension of Brahmini Coalfield was done. The palynomorphs recorded from the intertrappean bed (at 42.75-45.11 m) show continuity of the composition from the underlying upper part (57.40-67.30 m) of Dubrajpur Formation. The composition shows dominance of *Araucariacites* together with *Podocarpites* in association with *Callialasporites*. The stratigraphic marker taxa present are *Ruffordiaspora*, *Aequitriradites*, *Murospora*, *Januasporites*, *Klukisporites* and *Gleicheniidites*, indicating Early Cretaceous age. The underlying coal-bearing horizon (76.10-211.70 m) is analysed. The assemblage shows presence of marker spores—pollen taxa—*Gondisporites*, *Indospora*, *Densipollenites* (*D. magnicarpus*, *D. annulatus*, *D. marginalis*) of Late Permian affinity. The report of palynodating of the borehole has been sent to Coal Wing, Geological Survey of India. Besides visited Rajmahal Basin and collected subsurface samples (22) from three bore-holes—RJKS-1, 2 and RJSJ-5, all drilled in the southern extension of Brahmini Coalfield. These bore-holes penetrated one intertrappean bed and the underlying coal-bearing horizons.

Archana Tripathi

Studied petrified woods assignable to the Podocarpaceae and Araucariaceae from the Kota Formation, Pranhita-Godavari Graben. Dominance of

members of these families has been noticed and prevalence of Conifer forest in the vicinity of depositional site has been inferred. Regional variability was attributed to environmental factors. Floristic studies on Early Cretaceous Flora of Gangapur Formation suggest that fluvial settings were more congenial for plant part preservation. Composite analysis of plant megafossils, pollen/spore, cuticles, tracheids and associated organic material reflect conditioning of preservation due to taphonomic setting. Paucity of plant fossils in the Lameta Formation has been attributed to sub-aerial environment influencing the sediment nature and poor preservation of plant parts except hard parts. Dominance of conifer seeds, axis and strobilii substantiate this viewpoint.

A. Rajanikanth

Investigated the floral assemblage of the Athgarh Formation, which revealed that it is dominated by conifers and pteridophytes, followed by cycadophytes. The Early Cretaceous Athgarh flora is coeval to Bansa flora of Jabalpur Formation. Although the index fossil *Weichselia*, so far, has not been reported from here, but the dispersed spore *Lametatriletes indicus* similar to *in situ* spore of *Weichselia* has been recorded. Therefore, it has been postulated that this flora may be an eastern extension of Bansa flora of Central India.

Flora of Gollapalle and Vemavaram formations and Raghavapuram Shale revealed that conifers and cycadophytes on the whole dominate the palaeoflora. Pteridophytes are comparatively less in occurrence. On comparing the flora with Early Cretaceous flora of India it has been observed that this palaeoflora is coeval to Early Cretaceous flora of Sehora, Jabalpur Formation. Megaflora of Sriperumbudur beds of Palar Basin revealed that cycadophytes and conifers in general, dominate the flora. Ginkgoales and pteridosperms are poorly represented.

Neeru Prakash

The megafloral assemblage recovered from a Fire Clay Quarry near Songad (Gujarat) reveals that this assemblage is mainly dominated by the conifer genus *Pagiophyllum*. The other floral elements of this assemblage are *Cladophlebis* sp., *Sphenopteris* sp., *Elatocladus confertus* and *Araucarites cutchensis*, etc.

The other Fire Clay Quarry (about 100 m apart) shows the dominance of conifer genus *Brachyphyllum* along with rare occurrence of the genus *Araucarites* in the assemblage. Thus, the well preserved recovery of different types of plant assemblages indicates that they

were growing in the vicinity of ponds/lakes during the time of deposition.

B.N. Jana

Component 2: Morphotaxonomy, floristics, evolution, biostratigraphy and palaeoenvironmental studies of Triassic-Cretaceous of South Rewa-Satpura basins

Ultrastructural studies have added details to the study done on optics. As a result of ultrastructural studies, several fruiting bodies which could not be distinguished have displayed the distinction of being either

microsporangiate or megasporangiate fructifications. Their detailed analysis is in process.

S.C. Srivastava & Neeru Prakash

Project 14: Accretionary evolution and tectonics of Terranes in Ladakh-Karakoram Sector

Himalayan mountain building is the product of collision between the Indian and Asian plates which began during the Eocene epoch. This collision is the major tectonic event in the Cenozoic era. Certain key issues and new areas of research have been identified. These new research areas will definitely pave way for the geoscientists to work across the Himalayan-Eastern Karakoram transect. Some important issues are:

- ◆ The age of initiation of collision is still poorly known. Based on available data the estimates range from the Late Cretaceous (>65 Ma) to latest Eocene (<40 Ma). Therefore, more direct data are required to delimit and abridge the gap of the timing of initiation of this collision.

- ◆ The timing of the movement on the major faults and their behavioural changes are poorly understood. Therefore, the behavioural changes of these faults when uplifted rapidly, with respect to isotope fluid migration is important to understand rapid uplift and active tectonics involved in the region.

- ◆ The discovery of coesite in the Kaghan Valley and Tso-Morari is a significant development and has considerable economic potential consequently. Studies on the Himalayan belt be focused to unravel more areas of Ultra High Pressure Metamorphism (UHPM).

- ◆ Radiometric and biostratigraphic aspects of the Shyok Suture and the Eastern Karakoram Block should

be done on priority basis to constrain tectonic events, which can help in better understanding of the India-Asia subduction and collision processes.

- ◆ Detailed geological and palaeobotanical investigations are needed in the Ladakh and the Eastern Karakoram to understand the palaeogeography and terrane accretion in the northern extent of the Gondwanaland.

- ◆ Lateral extent of the Karakoram is still poorly known. Therefore, efforts have to be made to trace the extension, primarily in the Eastern Karakoram and Western Tibet by Indian and Chinese scientists.

- ◆ To identify terrane boundary between Qiangtang and Lhasa in the Eastern Karakoram Block.

- ◆ Palaeoclimatic and neo-tectonic studies of Pliocene-Quaternary successions across the Himalaya-Karakoram and the Tibet would lead us to draw palaeoclimatic modelling, rapid uplift-exhumation and identification of seismogenic events in the pre-historic past.

- ◆ Effects of the Pan-African movement in the Himalayan region should be dealt in greater detail to draw fruitful conclusions regarding Pre-Himalayan tectonics.

- ◆ To identify the seismicity gap areas in the entire sector of the Himalaya-Karakoram and the Tibet.

A.K. Sinha

Carried out Light-microscopic documentation of Middle Jurassic nannofossil assemblage from a sedimentary sequence of Eastern Karakorum Block. The assemblage though lacking diversity is dated early Callovian on the basis of presence of marker *Ansulasphaera helvetica*. The assemblage is dominated by sturdy *Watznaueria* spp. and shows heavy

recrystallization in most of the delicate forms obscuring precise identification. The occurrence of Middle Jurassic ammonoid *Chaufatia furcula* sp. confirms this age connotation.

Rajeev Upadhyay, Jyotsana Rai & A.K. Sinha

Thrust Area : Biopetrology of Indian Coals in relation to Coal Bed Methane

Project 6: Coalification processes and depositional environment of coal and associated sediments

Component 1: Organic matter characterization from plant fossils and DOM in Cenozoic sediments

The palynofacies of the lignitic clay deposits at Amberiwadi, Sindhudurg Formation (Maharashtra Coast) is mainly composed of land derived organic matters with rare marine entities. The overall organic matters are heterogenous in nature consist of rich cuticles, terrestrial wood and root tissues, biodegraded, amorphous, gelified matters, resin bodies, black debris, pollen-spores and fungal fruiting bodies, etc. The over

all assemblage shows relatively rich structured organic matters and low percentage of unstructured materials. By integrating various types of organic matters and their frequency calibrations with associated lithology the depositional environment of the bed has been evaluated.

G.P. Srivastava, Manoj Shukla & Madhav Kumar

Component 2: Biopetrographic evaluation, genesis and depositional history of Indian coals

(I) Organic petrological evaluation of Karanpura coal deposit (Damodar Basin) in relation to carbonization properties, genesis and depositional history

Studied microconstituents (macerals/microlithotypes) of coals from Jarangdih Colliery to assess the nature and composition of coals. The coals belong to Early Permian Barakar Formation of East Bokaro Coalfield. In general, coals are found to be rich in vitrinite macerals (vitric and fusovitric coal types) followed by inertinite and liptinite macerals. Likewise, their vitrite, clarite, vitrinertite and duroclarite microlithotypes are high. The rank values (Ro max. 0.78-

0.92%) determined through reflectance measurements on maceral vitrinite indicate that the coals have attained high-volatile bituminous A-B stages. The rank and composition of coals indicate that these coals are within the threshold of coal bed methane (thermogenic) generation.

B.K. Misra & B.D. Singh

(II) *Biopetrology of Wardha-Godavari Valley coals*

A comparative study regarding the biopetrological characteristics of the coals from Telvasa (Chandrapur District) and Junad Open Cast mine (Yeotmal District) has been undertaken to understand the nature and composition of these coals so as to estimate their economical potentials. The study suggests that the coals have attained the rank of high volatile bituminous C stage. The top part of the coal seam in both these areas is mostly

shaly in nature, however the coal at the bottom part is of good quality. On the basis of the maceral study these coals have been mainly classified under mixed and fusic types. It has also been observed that the number of the dirt bands increases as we move from Telvasa towards the Junad Open Cast Mine.

O.S. Sarate

(III) *Biopetrographic evaluation of coals from Satpura Gondwana Basin with an emphasis on depositional pattern and utilization potential.*

Quantitatively assessed microconstituents of coals from Ghorawari and Maori underground mines of Kanhan area of Pench-Kanhan Coalfield under normal and fluorescence modes. The study reveals that the vitric (vitrinite-rich) and mixed (vitrinite/inertinite-rich) coal types has variable proportions of macerals and mineral matter association. The rank values (Ro max. 0.50-0.81%), determined by reflectivity measurements on maceral vitrinite, indicate these coals have attained high-volatile bituminous stage. Comparatively coals of the Maori area (east) are of poor quality and low rank as

that of Ghorawari area (west). The coals contain high amount of fluorescing macerals (perhydrous vitrinite and liptinites). Liptinite group showing manifold increase under fluorescence mode is chiefly constituted by sporinite and liptodetrinite macerals. Ghorawari coals are found to be within the threshold of coal bed methane generation. Coal types indicate that the seams have been formed from woody and herbaceous vegetation with frequent spells of oxidative/aerobic conditions.

Alpana Singh & B.D. Singh

(IV) *Organic petrographic evaluation of coal seams from Talcher Coalfield.*

Petrographic evaluation of coals shows characteristic association of all maceral groups. Vitrinite group generally consists of telinite, desmocollinite and telocollinite macerals. Vitrodetrinite has also been noticed in seams I and IV. Fusinite, semifusinite, pyrofusinite, macrinite and inertodetrinite make the persistent occurrences in these coals. The record of pyrofusinite in these coals suggests the role of forest fires in the development of palaeoecosystem of swamp. Liptinite in general consists of sporinite, resinite, cutinite and liptodetrinite. However, the characteristic occurrence of alginite has been noticed in these coals at different time levels. Mineral matter, viz. pyrite, siderite and clay minerals are mainly associated with these coals. Resolution of petrographic facies, viz.

Vitric, Vitrofuscic, Fusovitric, Fusic, based on maceral variance suggests prevalence of fluctuating euxinic conditions which led to the development of dull, semidull banded nature of Talcher coals. However, high variability in maceral variance under normal light in time and space is due to dull, semidull and bright banded nature of these coals. Intense fluorescing tendency along with characteristic aromatized peak pattern (2800-3400 cm⁻¹, 1600 cm⁻¹) show low rank (Ro max in oil 0.6-0.7%) nature of these coals which make them unsuitable for CBM generation.

Rakesh Saxena & Jyotsana Rai

Component 3: Sedimentary organic matter characterization of Indian lignites

Processed lignite samples from Barmer, Panandhro, Rajpardeeh and Vastan areas for their biodiagenetic studies. Selected lignite samples of Barmer area are subjected to infra-red studies (in collaboration with scientists from C.D.R.I. and N.R.L.C., Lucknow.) IR curves of the resins associated with the lignites also show conformity in the occurrence of aliphatic and aromatic

peaks indicating similar source material for the genesis of these lignites. Further, these lignites also contain pyrites which degrade its quality. Resins are characteristically associated with these lignites in disseminated, impersistent and some time in persistent layer forms.

Rakesh Saxena & Jyotsana Rai

Component 4: Biopetrography and geochemistry of coals, oil shales and organic matter in Late Palaeocene-Oligocene sediments from northeastern India

An analysis of petrographic data generated on coal samples from the Makum (Main Seam, Tikak Colliery) and Dilli-Jeypore (A1-A3 seams) coalfields, Assam shows that compositionally similar coals of the two areas have some distinct differences in their physical and maceral characteristics. The coals from Makum Coalfield are softer and more brittle than that from Dilli-Jeypore. The Makum coals have an average higher proportion of perhydrous vitrinite and total fluorescing macerals than the Dilli-Jeypore coals. Whereas, the later coals characteristically have higher particulate liptinite macerals (sporinite, cutinite, resinite, etc.) and also relatively high

inertinite macerals than the former coals. These physical and petrographic differences between the coals of Makum and Dilli-Jeypore coalfields appear to have been caused by the variations in certain depositional factors during the course of their coalification.

Collected information on the inertinite macerals, excluding funginite of Tertiary coals from Garo and Jaintia Hills of Meghalaya, Assam and Nagaland in order to ascertain their origin, other than that from fire.

B.K. Misra

Thrust Area : Floristics of Petroliferous Basins

Project 7: Morphotaxonomy, floristics, biostratigraphy and sedimentological studies of Tertiary sediments of Lesser Himalayas

Component 1: Floristics and biostratigraphy of Pre-Siwalik sediments

A paper describing fossil dicotyledonous woods from Jammu region was finalized. Some leaves, leguminous leaflets and roots were scanned, photographed and studied from the Kasauli Formation of Himachal Pradesh. The wood and leaf remains indicate the occurrence of warm and humid conditions in the Himachal Pradesh and Jammu and Kashmir.

J.S. Guleria & Rashmi Srivastava

Palynofossils and dispersed organic matter (DOM) recovered from the 240 m thick well exposed section of the Subathu Formation (Early Ypresian-Middle Lutetian) from Chamla area, Morni Hills (Haryana) have been characterized and interpreted in terms of varying palaeoenvironmental conditions during its deposition. Different types of OM constituents are characterised, viz., black debris, brown degraded debris, structured debris, yellow debris, amorphous, pollen/spore and dinocyst. Four types of palynofacies are characterised

which indicate that basal carbonaceous shales were deposited in a fresh water swamp environment. Later, a shallow marine epineritic condition was formed under the influence of rising sea-level in a transgressive system tract. An open lagoon followed by closed lagoon and finally delta plain environment were formed during progradational sequence of high stand system tract in the area of investigation.

A new dinoflagellate cyst genus *Gochteosphaera* has been instituted from the Subathu Formation (Early Lutetian) of Shimla Hills (HP). It is distributed in high frequency in the upper part of the Subathu Formation. Being associated with a brackish water environment and restricted to Early Lutetian sediments of the Subathu Formation, this new taxon could be a potentially useful biostratigraphic marker for the Eocene strata in the Lesser Himalayas. Fossilized coenobia of the green alga *Pediastrum*, recovered from marine sediments of the Subathu Formation from the Shimla Hills and Morni Hills have been compared with the extant species reported from India. Several morphotypes have been identified up to species level. Stratigraphic and palaeoenvironmental significance of this alga has been worked out.

A combined study of palynology, palynofacies and field sedimentology (in collaboration with Prof. I.B. Singh, Lucknow University) is performed on the Subathu Formation (Late Thanetian-Late Ypresian) in Tal Valley area of Garhwal Himalayas. Based on significant changes in the distribution pattern of different OM, types four palynofacies units are identified: Unit I— carbonaceous shales containing abundant terrestrial OM and well preserved vegetative parts of *Chara* indicate a brackish swamp environment, which was formed as a result of rise in relative ground water base level in coastal low



Gochteosphaera subathuensis

lying areas. Lower horizon of Unit I represents paleosol complex in land. Unit II— Cyanobacteria-rich sediments were deposited in low relief intertidal-supratidal region during early phase of rising sea-level. Fine-grained clastics of Unit III comprising forams and marine dinoflagellate cysts indicate an estuarine environment during early phase of progradational sequence. Land derived oxidised debris and occurrence of cyanobacteria in Unit IV indicate that the sediments were deposited during late phase of progradational sequence in a tidal flat environment. The succession represents deposition in a single transgressive phase, where Units I and II represent transgressive system tract and Units III and IV represent high stand system tract. Sarkar visited Central National Herbarium, Howrah for comparing fossil angiosperm pollen recorded from the Subathu Formation of Lesser Himalayas with pollen of extant taxa.

Samir Sarkar & Vandana Prasad

Component 2: Floristics, biostratigraphy and sedimentological studies of Siwalik sediments

Palynological and sedimentological studies on Lower and Middle Siwalik sequence (about 1600 m thick) exposed along Nandni-Nagrota Road on Jammu-Srinagar Highway, Jammu were completed and finalised. Rock samples from silty-muddy fine-grained horizons are investigated for the study of palynofossils. Pteridophytic spores and gymnospermic and angiospermic pollen constitute the recovered palynoflora. Spores of the families Cyatheaceae, Schizaeaceae, Parkeriaceae and

Polypodiaceae represent pteridophytes. Gymnosperm pollen of the family Pinaceae are profusely recorded. Angiosperm pollen are less in number and belong to the families Magnoliaceae and Asteraceae. Presence of pollen showing affinity with plants inhabiting the high elevations in high frequency and few spore/pollen representing the local flora coupled with increased thickness of channelled sand bodies indicate incision of the rivers into their valleys. It is inferred that the flood

plains were very narrow and were regularly flooded. The growth of local flora was thus disallowed. Occurrence of higher and lower elevation elements in the same samples indicates that the areas lying at different elevations acted as the provenance for the studied Lower and Middle Siwalik successions. Based on sedimentological studies two facies associations are identified in the fine-grained muddy horizons of these successions. One of these associations is inferred to have been deposited in the flood plains while the other one in the interfluvial area.

S.K.M. Tripathi

Carried out chemical processing of the samples from Lower-Middle Siwalik sediments exposed along Bilaspur-Mandi Road Section (Kangra District), Markanda River Section (Himachal Pradesh) and Upper Siwalik sediments exposed at Khetpurali (Haryana). Scanning and photodocumentation of selected taxa have been done. The assemblage recovered from the areas are mainly represented by *Striatriletes*, *Lycopodiumsporites*, *Pteridacidites*, *Pinjoriapollis*, *Lakiapollis*, *Retitrescolpites*, *Inaperturopollenites*, *Pinuspollenites* and *Abiespollenites*. Gymnosperm pollen are dominant in the assemblage over angiospermous pollen followed by pteridophytic spores. The recovery of palynoassemblage from Khetpurali section is poor and mainly represented by *Striatriletes* (*Ceratopteris*), *Lygodiumsporites* (*Lygodium*), *Pinuspollenites* (*Pinus*) and *Pinjoriapollis* (*Magnolia*). *Spirogyra*, *Mougeotia* and *Zygnema* belong to Zygnemataceae are also recorded.

M.R. Rao

Investigation on plant megafossils (woods, leaf and fruit impressions) from the Siwalik sediments of Tanakpur area (UP) reveals the occurrence of 40 taxa of angiosperms. A fossil leaf of *Clinogyne grandis* (Marantaceae) represents monocot. Most of the species are new to the Tertiary flora of India. The characteristically Neogene family Fabaceae dominate the plant assemblage comprising the genera *Millettia*, *Derris*, *Ormosia*, *Cynometra*, *Humboldtia*, *Bauhinia* and *Albizia*. On the basis of nearest living relative the floral assemblage consists of three major types of elements— i) evergreen

(60%), ii) evergreen and moist deciduous (22%), and iii) mixed deciduous (18%). The evergreen elements dominated the flora of studied area during the Miocene period in contrast to mixed deciduous elements that dominate today. The present day distribution of modern equivalent taxa of the fossil plants indicate that the exotic genera had wider distribution during Miocene period which subsequently contracted mainly due to change in climate after Miocene onward. Collected plant megafossils (leaf and fruit impressions) from more than ten beds of a well exposed (about 2500 m thick) section in Tanakpur area. Systematic collection of paleosol samples was also made for their isotopic analysis.

Carried out morphotaxonomical study of leaf impressions from Siwalik sediments of Ranital area, Himachal Pradesh. A fossil leaf showing resemblance with a palm— *Amesoneuron* has been reported for the first time from the area. The presence of palm along with some dicot evergreen elements (*Millettia*, *Hydnocarpus*, *Kayea*) indicate existence of tropical evergreen vegetation. The monographic work on Siwalik flora is being continued.

Mahesh Prasad

Studied palynofossils recovered from the sediments of Kimin Formation exposed on Itanagar-Naharlagun Road (NH 52A), Papumpare District, Arunachal Pradesh. Important palynotaxa recovered from the formation are *Striatriletes*, *Malayaeaspora*, *Schizaeoisporites*, *Palmaepollenites*, *Phragmothyrites*, etc., besides reworked Gondwana palynofossils like *Rhizomaspora*, *Callialasporites*, etc. The distribution of the families in the assemblage indicates that the area enjoyed tropical to subtropical, warm, humid climate at the time of deposition of Kimin Formation. The basin in which these sediments were deposited had connections with fresh water swamps and ponding conditions nearby. Presence of reworked Gondwana palynotaxa indicates that the Gondwana sediments were exposed nearby and were the source rocks for the younger Tertiary sediments. A manuscript entitled “New names for two angiospermous pollen grains from the Tertiary sediments of north-east India” is documented.

G.K. Trivedi

Project 8: Tertiary floristics of peninsular India

Component 1: Tertiary floral diversity in North-East India

Palynological study of the Siju and Rewak formations exposed in a stream section at Jenggitchakgre and along Tura-Dalu Road in West Garo Hills, Meghalaya has been finalized. The Siju palynoflora is dominated by dinoflagellate cysts and acritarchs, whereas the Rewak palynoflora is mainly represented by spores-pollen followed by fungal remains and dinoflagellate cysts. The dominance of terrestrial elements and decrease of dinocysts indicates a regressive phase during the sedimentation of the Rewak Formation. Based on palynoflora, a Middle Eocene age has been assigned to the Siju Formation and Late Eocene to the overlying Rewak Formation. Chemical processing of the samples from the Boldamgiri Formation, exposed along Adugiri-Purakhasia Road near Boldamgiri in West Garo Hills is also done and a rich palynoflora has been recovered. The important palynotaxa in the lower part of the studied sequence are *Striatriletes* spp., *Palmaepollenites eocenicus*, *P. communis*, *Neocouperipollis brevispinosus*, *Rhoipites* sp., etc., whereas *Lygodiumsporites lakiensis*, *Polypodiisporites* spp., *Pinuspollenites* sp., *Podocarpidites ellipticus*, *Bombacacidites triangulatus* and *Polyporina* sp occur in the upper part. Dinoflagellate cysts occur throughout the sequence. The palynoflora indicates presence of swampy conditions with brackish water influence. *Pinuspollenites* and *Podocarpidites* appear to be transported from the highland areas occurring nearby.

R.K. Saxena & Samir Sarkar

The study of degradation of organic matter and mineral evolved during their diagenesis is undertaken to observe in the samples from Bihpuria well –A, Upper Assam between depth 4444.5 m to 4380.0 m (Palaeocene), deposited just above the Precambrian gneisses. It is observed that a large number of biodegraded organic matters contain accumulation of iron sulphides and other minerals. A significant contribution of other dissolved metals (elements) e.g., Ca, Na, Zn,

Pb, P, Mo, SiO, Cl, etc are represented in the organic substrate also help in genesis of frambooids. These elements provide valuable information on the biogenic reactivity in organic matter deposited at the bottom of marginal marine deposits. The frequency representation of these minerals and morphology of biogenic pyrites are illustrated through SEM and EDAX analysis.

Madhav Kumar

A fossil wood from the Champanagar Formation of Bisalgarh near Agartala, Tripura was studied in detail and prepared manuscript on the same. Completed study on the plant remains belonging to the Oligocene of Mizoram and finalized a manuscript. A few plant impressions collected from the Oligocene sediments of the Makum Coalfield, Assam were identified and their further investigation is under progress.

R.C. Mehrotra

Palynologically analysed outcrop samples of claystone, shale and alternation of sandstone from Champhai, eastern Mizoram. Out of identified 47 genera and 60 species, pteridophytic spores represent 8 genera and 11 species, angiosperm pollen - 27 genera and 35 species and gymnosperm pollen - 6 genera and 6 species. Fungal remains are also encountered. Some significant constituents of the assemblage are *Dictyophyllidites*, *Pteridacidites*, *Polypodiisporites*, *Lycopodiumsporites*, *Compositoipollenites*, *Polygonacidites*, *Malvacearumpollis*, *Hibisceapollenites*, *Cupuliferoipollenites*, *Alnipollenites*, *Engelhardtoidites*, *Pinuspollenites*, *Piceapollenites* and *Podocarpidites*. Qualitative dominance of angiosperm pollen is a conspicuous feature of the assemblage. The recorded palynological assemblage indicates the prevalence of wet semi-evergreen type of vegetation with warm and humid tropical to temperate climate with plenty of rainfall during sedimentation. The sedimentation took place in shallow water deltaic to paralic condition. On the basis of

comparison of the present assemblage with the known Indian Tertiary palynofossil assemblage of an Upper Miocene age has been assigned.

B.D. Mandaokar

Component 2: Tertiary floristics of peninsular India

Fossil leaves of *Polyalthia*, *Hydnocarpus* and *Eranthemum* belonging to families Annonaceae, Flacourtiaceae and Acanthaceae, respectively have been identified from the Eocene deposits (Fuller's earth) of Barmer, Rajasthan. In contrast to prevailing dry and desertic conditions around Barmer the fossils indicate existence of tropical moist conditions during Eocene period.

J.S. Guleria

Recorded a rich palynofloral assemblage from a section belonging to Naredi Formation (Early Eocene), exposed in Kliari River, ENE of Aida village, Kutch Basin. The association of dominant taxa like *Cheilanthoidspora enigmata*, *Retitritilapites kutchensis*, *Acanthotricolpites kutchensis* show close similarity with the palynoflora of the basal part of type section of Naredi Formation and the Panandhro Lignite quarry section. However, the swamp taxa (*Lakiapollis*, *Meliapollis*, *Pellicieroipollis*) and dinocysts represent poorly in this section unlike Panandhro and Naredi type sections. Upper part of the section containing khaki and red clays is devoid of palynofossils. Analyses of data from different sections of the formation are in progress. Samples from two sections of Maniyara Fort Formation exposed along Ramania stream did not yield any palynofossil.

J.P. Mandal

Studied under SEM important palynomorphs from Neyveli Lignite samples of Mine I and II. The characteristic morphological features are noted and different exine patterns are used to deduce the ecological significance during their deposition. The palynological histogram indicates qualitative and quantitative appearance of the characteristic forms from top to bottom of the mine (about 25 m thick). Palynological data are further used to deduce the age of the lignite which indicate

probably Lower Miocene age.

K. Ambwani

Studies on palynofossils from Akli Formation, Giral lignite mine, Barmer District are continued. Dinoflagellate cysts, fungal remains, pteridophytic spores and angiospermic pollen constitute the palynofloral assemblage. Majority of families (Schizaceae, Areaceae, Oleaceae, Lamiaceae, Guttiferae) represented in the assemblage are tropical to subtropical in present-day distribution, while others (Osmundaceae, Matoniaceae, Lycopodiaceae, Liliaceae, Onagraceae) are cosmopolitan. On the basis of high frequency of *Nypa*/*Nypa*-like pollen (*Spinizonocolpites* spp., *Kapuripollenites* spp., *Retiverrumonosulcites barmerensis* and *Clavadiaporipollenites raneriensis*) in the assemblage, it is inferred that deposition of the sediments took place in an area which was fringed by thick vegetation of mangrove chiefly constituted by *Nypa*. Different species of *Proxapertites*, *Palmaepollenites*, *Palmidites* and *Arecipites* in the assemblage clearly indicate a coastal area close to the site of deposition. Pteridophytic spores and other angiospermic elements in the assemblage were driven to the site of deposition through the river channels. Marine influence is evidenced by the presence of dinoflagellate cysts in the assemblage. Good representation of fungal remains suggests warm and humid conditions with high precipitation.

Sedimentological studies, supporting the palynological inferences, indicate that the studied sequence was deposited in the flood plain with marine incursions. These conclusions are drawn on the basis of the inferred channel fill sedimentation and fining upward nature of each lignite cycle in the Akli Formation. The dominant bentonitic claystone facies of this formation represent low energy shallow basinal sedimentation. Occasional thin sandstone beds and siltstone within claystone show that the basin was periodically affected by flood events. A manuscript dealing with palynological

studies on samples from Thumbli Member of Akli Formation is finalised.

S.K.M. Tripathi

A rich palynological assemblage has been recorded for the first time from the Miocene sediments exposed along Kullur-Kavur road, Mangalore (Karnataka). The assemblage is dominated by angiosperm pollen followed by pteridophytic spores. Gymnosperm pollen are scarcely present. Besides, a good number of dinoflagellate cysts and fungal remains have also been recorded. Present day distribution of the various plant families and abundance of fungal remains and pteridophytic spores indicate tropical-sub-tropical (warm-humid) climate during the sedimentation. Good representation of dinoflagellate cysts and pollen of mangrove and coastal elements suggests a near-shore environment of deposition. The assemblage also contains significant reworked Permian (*Densipollenites*, *Scheuringipollenites*, *Parasaccites*, *Faunipollenites*) and Cretaceous (*Callialasporites*, *Araucariacites*, *Alisporites*) spore-pollen. Such occurrences can possibly be explained through reworking of older sediments within the basin or transported from adjoining basins. A comparison of the present palynofloral assemblage with those known from the Indian Tertiary sediments shows its close resemblance with the Miocene palynoflora recovered from Quilon and Warkalli beds of Kerala Basin. Finalised two papers on palynological aspect of Sindhudurg Formation (Maharashtra) and one on reworked Permian and Cretaceous palynofossils from Mangalore area.

Visited French Institute, Pondicherry and studied modern flora belonging to Western Ghats of South India. Besides visited Geological Survey of India, Bangalore for consultation of literature on Tertiary sediments exposed along Mangalore and adjoining areas.

M.R. Rao

Processed samples from the cliff sections (Warkalli Formation) of Paravur, Ernakulam and Cannanore shores of western Kerala for palynological study. The palynologically productive samples come from the horizons bearing carbonaceous clay and lenses of lignite.



Entada palaeoscandens (Awasthi & Prasad, 1990; Antal & Awasthi, 1993)

The assemblages recovered are assigned to the topmost cenozoone of the Tertiary sediments of Kerala—*Malvacearumpollis bakonyensis* Cenozoone. Pteridophytic spores out of which *Striatriletes susannae* is the most prominent element and dominate the assemblage. The palynological data indicate that the sediments were deposited in the marginal marine, paralic environment like estuarine or lagoon during warm and humid climate. The assemblages recovered from the cliff sections of the studied areas are homotaxial and are characteristic of Early Miocene age.

R.S. Singh

Carried out investigation on 48 fossil carbonised woods from Ratnagiri (Maharashtra) and Kerala. Structural details could not be observed due to poor preservation. One wood seems to be new, possibly of family Sonneratiaceae. Investigated 5 petrified woods from Pondicherry, one wood of family Podocarpaceae seems to be new. Finalized a paper on a carbonised fossil seed, viz. *Entada palaeoscandens* (Awasthi & Prasad) from Kalviwadi, Sindhudurg District, Ratnagiri. A carbonised fossil fruit from Warkalli Beds of Payangadi, Kerala has been identified as *Barringtonia* of family Lecythidaceae. Another carbonised fossil fruit from Neyveli Lignite deposits (Tamil Nadu) has also been identified as *Artocarpus chaplasi* belonging to family Moraceae. Tentatively identified a *Borassoid* Palm (Palmae) and 12 fossil leaves from Mine I of Neyveli

Lignite field. Made observations on the angiospermous dispersed leaf cuticles. The general morphological structure is comparable with the families Lauraceae, Sapindaceae and Schizandraceae. Visited Central

National Herbarium, Kolkata for the comparative study of fossil leaves with the modern leaves.

Anil Agarwal

Component 3: Palaeofloristics of sedimentary sequences associated with Deccan Traps

Carried out work on dicotyledonous woods from Dindori and Seoni districts of Madhya Pradesh. A young *Sonneratia* wood infected with endogenous fungi is identified from Ghansor, Seoni District. The fungi is characterised by filamentous ramifying mycelium consisting of septate and branching hyphae. Draft of a paper dealing with the wood is prepared. Besides, a number of fossil woods were cut and studied from Dindori District. They represent the known taxa like *Callistemon-Melaleuca*, *Eucalyptus*, *Lophopetalum*, *Sterculia*, *Barringtonia*, *Canarium*, etc.

Rashmi Srivastava

The northernmost extension of the Deccan Trap with a thin sedimentary intertrappean bed comprising volcanic ash, chert with scattered organic detritus exposed around village Papro, Lalitpur District (UP) is palynologically investigated and the assemblage recovered comprise algal and fungal remains, pteridophytic spores, paraphysis and

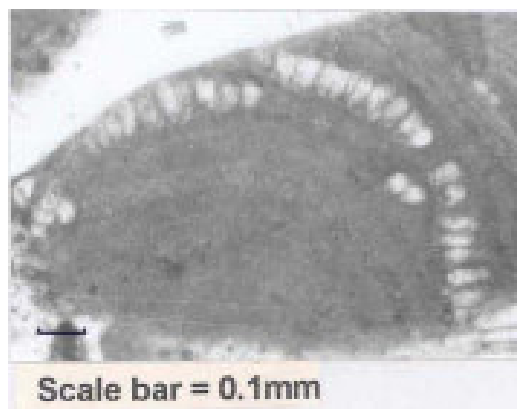
angiospermic pollen and cuticles. The assemblage is characterized by Late Palaeocene marker taxa—*Dandotiaspora dilata*, *D. pseudoauriculata*, *Lakiapollis ovatus* and *Spinizonocolpites echinatus*. The data suggest that the sediments were deposited under lacustrine condition during the quiescence phase of volcanic activity. The depositional environment was also marked with some degree of salinity as evidenced by the occurrence of halophytic remains (*Spinizonocolpites echinatus* and *Lithoparaphysis paproensis*) related to mangrove elements (*Nypa fruticans*), a palm and a fern (*Acrostichum aureum*), respectively. The Intertrappean sediments exposed near Naskal in Andhra Pradesh are also macerated and the palynomorphs recovered are being analysed, which are represented by *Triporoletes*, *Gabonisorites*, *Aquilapollenites*, *Mulleripollis*, *Ariadnaesporites*, *Azolla*, *Matanomadhiasulcites*, *Tricolporites* and other Maestrichtian marker species.

R.S. Singh

Project 9: Marine micropalaeontology of petroliferous basins

Component 1: Calcareous skeletal algae from the Tertiary sequences of Meghalaya and Kutch basins

Carried out studies on geniculate and non-geniculate coralline algae from the Cenozoic sediments of southwestern Kutch, and finalised a manuscript on coralline algal assemblage and its importance in palaeoenvironment and palaeobathymetry. Studied Palaeocene coralline algae (*Sporolithon*, *Phymatolithon*, *Mesophyllum*, etc.) from the Lakadong Limestone Member (Meghalaya) in thin sections. Also studied Maastrichtian algae (Dasycladacean, belonging to Chlorophyta and Corallinacean belonging to Rhodophyta) from Kallankurichchi Formation (Ariyalur Group) of Cauvery Basin. Visited areas in Tamil Nadu



Sporolithon sp. from the Late Palaeocene of Meghalaya (Lakadong Limestone).

and collected more than 120 suitable samples from different quarries, shallow wells and some outcrop sections from Pondicherry, Vridhachalam, Niniyur,

Sendurai and Therani, Uttatur, etc.

A.K. Ghosh

Component 2: Integrated phytoplankton biozonation and palynofacies analysis of Cretaceous-Tertiary sequences of Meghalaya and Kutch with emphasis on bioevents, time boundaries and palaeoenvironment

Rich dinoflagellate cyst assemblages are recovered from the coal-bearing Lakadong Sandstone exposed at Jathang, Mawsynram area, Khasi hills. The assemblage, showing predominance of *Apectodinium* and *Wilsonidinium* is assigned to the combined *A. hyperacanthum* - *A. augustum* Biozone of Late Thanetian age and precisely correlated with the assemblages known from the Cherrapunji Plateau. *Apectodinium* dominated assemblages from Cherrapunji – Mawsynram areas closely correspond to the globally synchronous “*Apectodinium*–acme” which is envisaged to be related to LPTM (Late Paleocene Thermal Maxima). Sudden proliferation of *Apectodinium* during LPTM is widely reported from high and mid (palaeo) latitudinal regions, however data from low latitude is scanty. The Indian occurrences may, therefore, provide environmental signatures of this short-lived extreme warming event, close to P/E boundary in low, equatorial (palaeo) latitudes. Direct age calibrations with shallow Benthic Zones (SBZ5-SBZ6) help to place *Apectodinium* – acme in Meghalaya close to mid P5 Zone (“probable LPTM age”). The predominance of *Apectodinium* suggests low salinity anoxic bottom conditions.

Palynofacies analysis shows marked fluctuations in dinocyst diversity and abundance associated with rich terrestrial organic matter and periodic increase in palynomorphs (*Spinozonocolpites* spp., *Proxapertites* spp., pteridophytic spores). Dinocyst and palynofacies data suggest reduced salinities due to enhanced coastal runoff and support estuarine to coastal swamp depositional environment. Coeval occurrence of thin impersistent coal in Lakadong Sandstone during sea level highstand is supposed to be associated with this warming event.

A unique feature noted at stratigraphic levels just



Fossil Desmid

underlying the thin coal band in Jathang, is the sudden influx of probable *desmid* like alga in association with rich unsorted land derived organic matter. Dinocysts are absent at this horizon. Morphologically, the recorded forms closely resemble the extant genus *Micrasterias*. Fossil desmids are rarely known and present finding from Late Thanetian is possibly their oldest record. Based on modern analogues a mild acidic (low ph), fresh water peat bog environment in a coastal low land area is interpreted.

A close succession of FAD and LAD of dinocyst marker species is summarised highlighting their potential in precise age determination and demarcation of various time boundaries within Late Campanian – Late Thanetian interval covering Mahadeo, Langpar and lower part of Sylhet Limestone formations. A manuscript entitled “Significant dinoflagellate cyst biohorizons in Upper Cretaceous-Palaeocene succession of Khasi Hills, Meghalaya” is finalised for submission.

Several dinocyst productive levels have been identified in upper part of Tura Formation, Siju Formation and lower part of Rewak Formation exposed in Dilni River Section, Garo Hills. The assemblages are rich and diverse and indicate Lower – Middle Eocene aspect. Calcareous nannofossil bioevents belonging to low latitude standard Nannofossil Zones CC25b to NP3 through Late Maastrichtian – Danian in Mahadeo and

Langpar formations of Khasi Hills are summarised and correlated globally. A manuscript is finalised.

A draft manuscript on biostratigraphic and palaeoenvironmental significance of dinoflagellate cysts from Type Naredi Formation (Kutch Basin) is prepared.

Rahul Garg, Khawaja-Ateequzzaman & Vandana Prasad

Component 3: Neogene microfossils from Andaman and Nicobar Islands and their stratigraphical significance

Studied siliceous microfossils from Neill and Havelock Islands. About 50 samples from two sections— Meetha Nala and Melville Point sections (Miocene-Pliocene) from Havelock Island and about 47 samples from two sections— East Coast and Nipple Hill sections (Miocene-Pliocene) from Neill Island are quantitatively analysed. Approximately 300 diatom valves per sample are counted from Neill East Coast (26 samples productive) and Nipple Hill sections (17 samples productive) for percentage frequency of selected diatom taxa. Different siliceous microfossil groups, viz. diatoms, silicoflagellates, sponge spicules, actiniscus, Archaeomonadaceae, phytoliths and radiolarians are counted. Their percentage frequency per gram of the sediment is also determined and selected specimens are photographed under SEM. Samples are also prepared for carbonate determination.

Samples from the two sections of the Neill Island contain abundant siliceous microfossils. But their preservation varies through the profiles as can be seen in the amount of fragmentation of diatom shells, the degree to which finer structures (like cribra in the areolae of the diatom shells) are preserved and the occasional rare occurrence of the authigenic mineral clinoptilolite. Among the siliceous skeletal remains, members of nine microfossil groups were identified. These are members of the zoobenthos (sponge spicules) phytobenthos (benthic diatoms) as well as members of the zooplankton (radiolaria, ebridians, actiniscids) and of the phytoplankton-diatoms, silicoflagellates, and Archaeomonadaceae (resting spores of Chrysophyceae). In addition, rare input from terrestrial sources is

encountered. These are phytoliths, which could either be derived from nearby islands or were wind-transported by the monsoons from distant land situated to the east. Most dominants among the siliceous microfossils are fully marine planktonic diatoms. Siliceous sponge spicules are the only other siliceous microfossil group besides diatoms that is quite common. Among them, besides the dominant monaxons, a multitude of different microscleres is present. Remains of the marine plankton groups ebridians and archaeomonads and of grasses from land (phytoliths) occur only in traces. The siliceous microfossils reflect an open marine depositional environment with input from habitats in and around oceanic islands. They also reflect times of relatively high primary productivity. Studies on a detailed account of the diatom species, their full taxonomic treatment and their abundance in these deposits is continuing. The preparation of an Annotated Synopsis of the geological studies so far carried out in the Andaman and Nicobar Islands is also in progress.

Anil Chandra & R.K. Saxena

Completed detailed studies on calcareous algae from the Car Nicobar Island and the Little Andaman Island. Prepared first draft of a paper on Taxonomic study (based on new anatomical characters) of geniculate and non-geniculate coralline algae from the Middle Pliocene of Car Nicobar Island, India, and palaeoenvironmental and palaeobiogeographical significance of the algal assemblage.

Anil Chandra, R.K. Saxena & A.K. Ghosh

Studied palynoflora of 5 sections belonging to Baratang Formation exposed in Baratang Island, Andaman for palynodating of the sediments. The yield of palynomorphs is meagre and age of these sediments ranging from Early to Late Eocene has been postulated on the presence of some stratigraphic important palynomorphs. Each section contains recycled

palynomorphs of Permian to Late Cretaceous age. Data from palynology, lithology and palaeocurrent favour the origin of these reworked taxa from Myanmar side. A manuscript has been prepared incorporating result of the study.

J.P. Mandal, A. Chandra & A.P. Bhattacharyya

Component 4: Late Mesozoic-Tertiary nanofossils from Andaman and Nicobar Islands and their biostratigraphical implications

Nannofossil studies, both under Light- and Scanning Electron Microscope from Neill Island (Nipple Hill and East Coast section) have indicated an assemblage belonging to *Discoaster bergrenii* Zone (CN 9A) of Okda and Bukry and the lower part of *D. quinqueramus* Zone (NN- 11) of Martini of Late Miocene age. Some important taxa are— *Calcidiscus macintyrei*, *Coccolithus miopelagicus*, *Ceratolithus acutus*, *Cyclococcolithus kingi*, *Discoaster bergrenii*, *D. brouweri*, *D. calcaris*, *D. challengerii*, *D. druggi*, *D.*

formosus, *D. intercalaris*, *D. pentaradiatus*, *D. variabilis*, *Helicosphaera carteri*, *H. euphratis*, *H. intermedia*, *H. recta*, *H. selli*, *H. wallichi*, *Pontosphaera multipora*, *Reticulofenestra pseudoumbilica*, *Rhabdosphaera perlonga*, *Schyphosphaera amphora*, *Spenolithus moriformis*, *Triquetrorhabdulus rugosus*, *Thoracosphaera* spp., etc. Reworked elements of Cretaceous and Palaeogene age are also noticed.

Jyotsana Rai

Thrust Area: Quaternary Vegetation, Climate and Monsoon

Project 10: Quaternary vegetation and palaeoenvironment

Component 1: Palaeovegetation and Palaeoclimate studies of Quaternary sediments from Himalayas

Finalized a manuscript entitled “Quaternary geology, tectonics and climate in the Champawat area- Eastern Kumaun Himalaya, India”. Palaeovegetation scenario of last 20,000 yrs. is revealed, corroborated with the earlier investigated Quaternary sections from Bilaspur and Wadda- both sites situated in Kumaun.

Chhaya Sharma

Finalized a manuscript entitled “Palaeovegetation and past climate of temperate zone of Kumaun Himalaya since Middle Holocene”. Prepared two Mss dealing with studies on Quaternary biocontents— indicating concealed tectonic disturbance at Kumaun Lesser Himalayas, and

other on vegetation and climate in temperate zone, Kumaun Himalaya (Saria Tal) since Middle Holocene.

A part of sediments of a profile ST-I (3.5m deep) from Sukha Tal, Kumaun Himalaya was investigated for pollen analysis. The palynoassemblage recovered consists palynomorphs of a large number of arboreal and nonarboreal taxa. Among arboreals *Pinus* and *Quercus* are chief elements. Shrubs are represented by Rosaceae, Rubiaceae, Rutaceae, Anacardiaceae and *Strobilanthes*. Ground cover shows dominance of Poaceae/ Cyperaceae. Chenopods/Asteraceae, Caryophyllaceae, Ranunculaceae, Polygonaceae, Brassicaceae, Apiaceae, *Artemisia*, Liliaceae and Tubuliflorae are encountered sporadically. Spores are represented by triletes,

monoletes and aletes. Aquatic vegetation consists *Pediastrum*, *Potamogeton*, *Nymphaea*, *Botryococcus*, *Lemna*, and *Myriophyllum*. Fungal remains are encountered in all samples. The vegetation scenario reflects presence of mixed oak forests with warm and humid climate at the region. Also carried out

palaeontological investigation of same profile and prepared relevant text-figure. Data generated from different disciplines broadly corroborates to each other.

Asha Gupta

Component 2: Origin and history of tropical forests in peninsular India

Accomplished the pollen analytical studies of ten moss polsters, forest humus and sub surface soils collected from forested and unforested areas around Dilli-Jeypore Colliery along Dilli river, Assam in a transect at an interval of 100 m distance. The pollen assemblage has revealed the low frequencies of most of the tree taxa as compared to their actual composition in the existing forests. The under representation of these taxa perhaps could be due to low pollen production and poor pollen preservation in the sediments. A pollen deposition model is finalized. Recorded three phases of climatic oscillations arid, semi-arid and warm and humid from a 1.5 m deep sediment profile of Kaki forest in Mikir Hill since last 15,000 years BP. Biodegradation of pollen-spores associated with saprophytic fungal remains in sediment profile are indicative of deterioration of forest cover during Early Holocene. A manuscript entitled "Early Holocene pollen data from Mikir Hills, Assam" is finalized.

S.K. Bera

Carried out pollen analysis of 4 surface samples from tropical deciduous sal forest distributed in Mada, District Sidhi (M.P.). The pollen assemblage has revealed the low frequencies of most of the tree taxa, such as *Shorea robusta*, *Madhuca indica*, *Emblica officinalis*, *Anogeissus*, *Syzygium*, etc. in contrast to their frequent occurrence in the forest. The under representation of all these taxa could be attributed to their poor pollen productivity owing to entomogamous mode of pollination. The encounter of non-arbores (Poaceae followed by Cerealia, Chen/Am, Asteraceae, etc.) in good frequencies corresponds more or less with their composition in the ground flora. This comparative database is used for the factual appraisal of past vegetation in the region. Completed pollen analysis of a

3 m deep sediment core from Bauri Swamp. The pollen sequence has shown that the mixed tropical deciduous forests consist of *Terminalia*, *Lagerstroemia*, *Emblica officinalis*, *Schleichera*, *Madhuca indica*, Anacardiaceae, etc. occurred in the region under warm and moist climatic regime during mid-Holocene. Subsequently, these mixed deciduous forests got transformed into tropical deciduous sal forests with the immigration and expansion of *Shorea robusta* as well as better representation of its close associates during Late Holocene. Such a change in the vegetation pattern implies a more-moist climate with increased precipitation prevailed in the region during this period.

Pollen analysis of 1.5 m deep sediment core from Dongar-Sarbar, Shahdol District (M.P.) has revealed that during Early Holocene, the tree-savannahs chiefly consisted of grass, Chen/Am together with sparsely distributed trees such as *Madhuca indica*, *Emblica officinalis* and *Schleichera* grew in the region under cool and dry climate. Later on, they were replaced by mixed deciduous forests with the immigration of some more trees (*Lagerstroemia*, *Syzygium*, *Mitragyna* and *Holoptelea*) due to onset of warm and moist climate. The modern Sal (*Shorea robusta*) forests were established around 1800 years B.P. due to prevalence of more -moist climate in the region.

M.S. Chauhan

Palynostratigraphical study of two sedimentary profiles from the Adyar Estuary, Chennai (about 5-6 km away from the present shoreline) shows the existence of true mangroves during Early (16680 yrs BP) and Middle (4280 yrs BP) Holocene although the preservation of pollen/spores in the sediments was poor. Presently, the area is devoid of mangroves except with stray occurrence

of *Thespesia populnea* near the shoreline. Exotics, such as *Prosopis juliflora*, *Casuarina*, *Lantana camara*, etc. are the abundant species. Introduction of *Casuarina* since Late Holocene, sewage and industrial effluent dump from urban agglomerates in South Chennai have affected the ecology at present not conducive for the mangroves to establish in Adyar estuary. Harmful Trace metals e.g., Cu, Pb and As are high in soil as well as in plants growing around the estuary.

Studied microbial degradation of organic matter (leaf microfragments) and subsequent biogenic mineral precipitation in peat sediments preserved in Pulicat lagoon and Pichavaram core/trench soil sediments using SEM and EDAX. Results indicate that the peat sediment formed by coastal vegetation and clastic organic and inorganic debris brought by rivers/streams buried in the coastal belt are the potent residing places for harmful trace elements especially the Arsenic.

The history of mangrove vegetation interalia climate and sea-level changes in Pichavaram and adjoining south-east coastal areas between latitude 10°-13° N is reviewed through palyno-chronostratigraphical studies of inland core sediment from Chidambaram, Natarajapuram, Muthupet and Marakkanam. Results

show that present mangrove cover is concentrated between 10°-12°N in Pichavaram, Muthupet and Marakkanam with vegetation not older than Late Holocene. However, mangroves between 12°-13°N Lat. existed during Early and Mid-Holocene (around 7000 yrs BP) and have drastically declined facing local extinction or species displacement by exotic plants since Late-Holocene. The evidences of palaeoshore-line 9-18 km W landwards from the present shoreline in Chennai and Pulicat lagoon, respectively coincide with the global Mid-Holocene transgression. The signature of this event is not observed in sediments dated Mid-Holocene (5650 yrs. BP) in Annamalainagar, Chidambaram which is located 14 km W inland. Mangrove establishment and degradation during Holocene in the south-east coast of India could be attributed to climate, sea level changes and neo-tectonic activity affecting the local microtopography. This effect was more pronounced during Late Holocene that gradually enhanced during the last three decades due to anthropogenic pressure.

Anjum Farooqui

Component 3: Studies of lake sediments in Rajasthan desert proxy climate signals

LM and SEM studies of different taxa of families— Malvaceae, Capparidaceae and Sterculiaceae from Rajasthan continued in order to facilitate precise identification of the recovered fossil pollen to their specific level. In addition, the pollen morphological studies of extant taxa are also carried out to ascertain the affinities between different genera and species as well as to determine evolutionary trends in these families.

Finalized a paper on pollen analytical investigations

carried out from Pachpadra- an extinct salt lake in Barmer District. The 1.40 m deep sedimentary profile could not be dated due to very low carbon content. However, the two dates are available from Bagundi, an extinct salt lake in the same district. The calibrated ages are, 2116 YBP for 90-100 cm depth and 13,816 YBP from 390-400 cm depth.

Chhaya Sharma & Chanchala Srivastava

Component 4 :Palaeomangroves and palaeoclimate in Andaman and Nicobar Islands during Quaternary Period

Pollen records have been used as evidence of palaeoenvironmental changes in a Quaternary section (BS-1595; 36,550 + 870 YBP), R.K. Puram, Little Andaman. Litho-, bio- and chrono stratigraphy studies

have been carried out to unveil the nature of sedimentary sequences in association with the events of marine transgression and regression. The pollen diagram exhibited evidence of several episodes of marine transgression,

regression and infrequent pollen zones. Out of which, seven periods of marine transgression, each followed by regression have been witnessed. The evidence for a transgressive episode is recorded by occurrence of high frequencies of *Avicennia*, *Rhizophora*, *Excoecaria*, *Heritiera*, etc., whereas marine regressive phases are evidenced by high frequencies of Poaceae, Cyperaceae and fern spores. Indication of rapid rise of Early Holocene sea-level has also been recognised. Some problems such

as qualitative and quantitative insufficiency of palynodebris, limited knowledge of over and under representation of pollen flora of Andaman region, potential forces especially cyclonic storms, oceanic/fluvial activities and records of palaeotidal changes are under consideration for precise interpretation of pollen diagram.

Asha Khandelwal

Component 5: Aerobiology in relation to pollen production, dispersal and preservation of pollen grains

Twenty-two more plant taxa of allergenic importance have been incorporated in 'An atlas of air-borne pollen grains of Lucknow plants and their allergenic significance'. The recorded taxa are *Ageratum conyzoides*, *Amaranthus viridis*, *Bougainvillea spectabilis*, *Brassica campestris*, *B. oleracea*, *Calotropis procera*, *Cassia biflora*, *Casuarina equisetifolia*, *Ceiba pentandra*, *Cyperus rotundus*, *Dahlia hybrida*,

Digitaria adscendens, *Imperata cylindrica*, *Joyasia* sp., *Mangifera indica*, *Melia azedarch*, *Murraya koenigii*, *Ranunculus scleratus*, *Rumex dentatus*, *Tagetes erecta*, *T. patula*, *Veronica anagallis-aquatica*. The work on phenological, aeropalynological and clinical details of each taxon is in progress.

Asha Khandelwal

Component 6: Vegetational history and climate during Quaternary in Antarctica

Twenty moss turfs, frozen soils and Lake shore sediments were analysed for palynological study. The study recorded long distance transported pollen spores — *Larix*, *Betula*, *Podocarpus*, *Pinus*, Poaceae, Caryophyllaceae, Tubuliflorae, Utricaceae-Moraceae, etc of tropical and temperate origin, which might have travelled thousand of km far away from the Antarctic main land. The study of aerospora (during 20th expedition-2000-01) over southern ocean and Antarctica main land recorded air borne palynodebris in low frequencies, viz., grass, sedge, tubuliflorae, fungal spores, varia, etc. in polar atmosphere. Finalized the study of aerospora (19th expedition) jointly with Asha Khandelwal.

A 60 cm sediment profile from Zub Lake below 6 m water column was palynologically analysed and on

the basis of fluctuations in the assemblage of various microbiota reflects three fold climatic oscillations— arid, warm and humid and warm and more humid since last 8,000 YBP. The modern pollen depositional studies through surface samples supplement the above inferences drawn from lake sediment pollen analysis although more detailed studies are required on more deeper lake sediment profiles existing in Schirmacher Oasis. Finalized the palynological as well as chronological studies of various samples and submitted a detailed technical report of work (19th expedition) to Department of Ocean Development, New Delhi.

S.K. Bera

Project 11: Archaeobotany and dendrochronology

Component 1: Ancient plant economy of pre- and proto-historic sites in northern and western India

Carried out study on a cumbersome carbonised botanical material recovered through archaeological excavations at Raja-Nala-Ka-Tila, in district Sonbhadra (UP). Unlike the settlements in fertile alluvial tracts, the ancient mound is situated in plateau region, on the left bank of the river Karmanasa. The evidences of plant remains from a wide range of cultural deposits have amply demonstrated a rich and varied exploitation of plant resources for food, during 1800-700 B.C. Agricultural economy of early occupants at the site is tangible by the identifiable remains of cultivated rice, barley, dwarf-wheat, bread-wheat, lentil, field-pea, grass-pea, chick-pea or gram, green-gram, horse-gram, moth-bean, til, field-brassica or brown-mustard, ragi-millet and italian-millet. Some minor millets, such as common-millet (*Panicum cf. miliaceum*), sawan (*Echinochloa colonum*), kodon (*Paspalum scrobiculatum*), etc., have also been found, but it is far-fetched to infer whether these minor cereals were gathered or formed a part of crop husbandry. Their seeds do not differ strikingly in the cultivated and wild forms. These are common grasses, which are also cultivated by the tribals in the hilly or plateau regions. For the environmental and cultural reasons, these minor cereals would have been very important in the past subsistence economy.

Associated with these cereals, millets, pulses and oil-seeds, the remains of weeds and other wild taxa have also been found as belonging to fox-tail grass, job's tear, goosefoot or bathua, dok, crowfoot-grass, dayflower, indigo, anjan-grass, siah-kanta, common-vetch, kala-jira, Jharberi, hurhur, dhatura, hejurchei and two sedges belonging to the species of *Cyperus* and *Fimbristylis*. Processed a large number of wood charcoals carried out section cutting and anatomical studies. Some of them belong to Mahua, palash, dahia, karanj, khair or babul, pangra, chironji, sal, wild karonda, anwala, gular, banyan, bel, sheesham or rosewood, salai, teak, amaltas and bamboo.

Two brief visits were made to an excavation site in a village Lahura Deva, District Kabirnagar (UP) in an attempt to search a new site and assess its cultural potentiality in archaeobotanical context. Collected a few

samples and their preliminary analysis confirmed the rich and varied agricultural economy right from the beginning of settlement precisely dated to ca. 2,135 B.C., evidenced by the cultivation of rice along with barley, wheat, lentil, field-pea, etc. Except rice, which is a native crop of Ganga Valley, the other ones of Harappan nutritional traits in north-western India got diffused in this region and must have been adjusted in altogether different ecological zone. This survey and preliminary observations have provided evidence / clue about the direct or indirect cultural contacts of people in far distant Ganga Valley region with archaeologically different Harappan area. The Future work will meaningfully fill up the gaps in our knowledge about the early diffusionary trends of Harappan crops in this region during 3rd millennium B.C.

K. S. Saraswat

Continued further studies on a large number of samples of carbonised remains from ancient Charda-Jamoga, district Bahraich (UP), datable from about 800/700 B.C. to 1100 A.D. Most of the finds of crops and other remains are of the similar kinds as reported earlier. However, the remains of weeds and other wild taxa make the new addition to the ancient economy.

Preliminary morphological investigations of archaeobotanical remains in 36 samples collected from ancient site

Pirvitani Sariff, village Trilokpur, district Sravasti (UP) in Rapti-Ghaghra Doab near the foothills of Himalayas-Siwalik reveal a wide variety of field crop remains, with advanced state of agricultural economy during the Painted Grey Ware (PGW) to Kushana periods. Botanical finds include rice, barley, bread wheat, dwarf wheat, moong, urad, lentil, gram, pea, arhar, khesari, linseed, brassica, ragi, kodon, soya, silk-cotton, cotton and *Ziziphus*. In their association, remains of wild and weedy taxa have been found, in which *Polygonum plebeium* and *Euphorbia dracunculoides* species are of particular significance in modern ethnobotanical context as an animal feed.

Chanchala Srivastava

Component 2: Tree ring analysis for reconstruction of Quaternary environment

Tree-ring samples of *Abies spectabilis* from Porting, Pithoragarh are cross-dated and ring-width measured. Ring-width chronology (AD 1710-1998) has been prepared. Tree growth and climate relationship has been studied using multiple regression analysis and cross correlation with monthly temperature and precipitation data.

Studied a set of 12 ring width chronologies of *Cedrus deodara* prepared for different localities in Joshimath and Uttarkashi for tree growth and climate relationship. The ring-width chronologies showed strong direct relationship with precipitation and negative with temperature. Mean spring temperature extending back to 1600 AD has been reconstructed and 20th century warming in context of the past four centuries analysed. The warmest 30-year mean for the 20th century is recorded during 1945-1974. The twentieth century warming in the Himalayan region in context of the past four centuries is well within the range of natural variability as warmer springs of greater

magnitude have occurred during the later part of the 17th century.

R.R. Yadav

Dated teak (*Tectona grandis*) core samples of 23 trees from Parambikulam Forest Division, Kerala. Several samples are found to have zone of micro rings at several intervals, which are identified and dated through cross dating technique. Ring widths of these samples have been measured. A chronology of this taxon, extending from 1747-2000 AD has been made. Tree growth climate relationship is in progress. A climatically sensitive tree ring chronology of *Pinus gerardiana* has also been made from the samples collected from Kinnaur Himachal Pradesh.

A. Bhattacharyya

Project 13: Geochronometry and Isotope studies

Component 1: Radiocarbon dating of deposits relating to Quaternary Period and archaeobotanical investigations and chemical analysis of sediments for palaeoenvironmental interpretations

Processed 169 samples, of which 141 are dated by using both the Quantulus and Rack beta counters for counting purposes. The lab received an AEI MS10 residual gas analysis mass spectrometer donated by NGRI. The mass spectrometer is converted for K-Ar dating and some test runs were conducted. However, the extraction system for argon from rock samples needs to be redesigned and the electronic system of the Mass Spectrometer be modified.

Carbonaceous sediment samples (3) from Mansar Lake are dated to establish the chronology of the past vegetational changes. The dates obtained are 4690 ± 120 , 1690 ± 120 and 1390 ± 110 YBP. Five carbonaceous sediment samples from Tapovan, Gangotri glacier were dated. The radiocarbon dates (9000 ± 450 , 1710 ± 90 ,

1910 ± 270 , 4210 ± 100 and 950 ± 80 YBP) reflect the temporal change in vegetation in relation to glacial fluctuation around Gangotri glacier throughout the Holocene. Carbonaceous samples from Chunabhatti (4610 ± 110), Jhunagar (7820 ± 120), Uran (6760 ± 200), Newvashi (6980 ± 370) and Chembupriyadarshini (4720 ± 110 YBP) are also dated. Two marine sediments, dated 8760 ± 430 and 14720 ± 440 YBP, helped to establish the sedimentation rate. Two carbonaceous sediments from Sukha Tal are dated and found to be contemporaneous (2690 ± 90 and 2670 ± 110 YBP at 280-285 cm and 35-40 cm respectively). Four oceanic sediments are dated as 11380 ± 100 , 11270 ± 100 , 19480 ± 150 and 3150 ± 110 YBP. Carbonaceous sediment samples are also dated from Koparkharine,

Adari Lake and Kalarkodu. The dates (1710±90, 6540±120 and 12390±140 YBP) reflect the change in vegetational pattern of 5,000 year interval. A shell sample from Akbarpur is found to be 12390±140 year old. Another shell from the intertidal zone at Tspettal is dated to be 2340±330 YBP.

Dated 4 samples from Charda in relation to the ancient settlement in Behara Dt. (UP) in order to match the cultural chronology with the radiocarbon dating. Good match is found with the archaeological sequence. Wood samples from the Zero Valley, Arunachal are dated. The radiocarbon dates indicate that forests of these kind of trees existed from 40,000 YBP to 750 YBP. Peat samples from Chidambaram are dated in order to estimate the timing of advancement or retreat of the

mangrove forest in connection to marine transgression and regression. Four sediment samples from the Surinsar Lake are dated as 560±110, 5390±80, 5430±110 and 8120±90 YBP. The radiocarbon dates show a nearly constant rate of deposition of sediment over a period of 8000 to 560 radiocarbon year. Consultancy rendered to the NIOT, Chennai reveals an interesting finding on marine archaeology. The preliminary radiocarbon dates of archaeological samples collected from the Cambay Basin set an age of 7500 yrs before present. Further work is warranted to confirm the existence of an ancient civilisation in this area.

G. Rajagopalan & Supria Chakraborty

Project 15: Special Activity

Component 1: Floristics and phytogeography of tropical and subtropical forests

Carried out SEM study of 35 angiosperm pollen grains of the families— Asteraceae, Apocyanaceae, Arecaceae, Euphorbiaceae, Acanthaceae, Annonaceae, Verbenaceae, Liliaceae and Solanaceae. Affinity of a monosulcate reticulate pollen with *Annonidium* is derived and a detailed study under SEM is carried out. A detailed morphological study of *Sclerosperma*, was done under SEM and finalized a manuscript.

K. Ambwani

Carried out SEM of 13 fruits of the genus *Cyperus* (Cyperaceae) to study the micromorphological features of the pericarp. The pericarps of different species have shown reticulate/papillate ornamentation of various types which are species specific and will be helpful in taxonomical and ecological interpretations.

Usha Bajpai, K. Ambwani & D.C. Saini

Studied and identified about 800 plant specimens collected from South Sahdol Forest Division (MP). Processed 400 plant species belonging to 203 genera and 106 families; polleniferous materials (300 species), wood blocks (10 samples), fruits and seeds (200 samples) and categorised, registered and kept them in their respective sections and families. Samples of ethnobotanical importance are also processed and kept separately. SEM photographs of nuts of 16 species of *Cyperus* are taken for detailed study of fruit morphology in Cyperaceae.

D.C. Saini

Contribution other than Project Work

Finalised a paper highlighting the palaeoecological significance of plant megafossil assemblage recovered from Jhuran and Bhuj formations of Kachchh Basin.

Jayasri Banerji

Some remarks on the glossopterids and stratigraphical distribution of their fructifications during the Permian on Gondwana Supercontinent- it has been found that various reconstructions proposed for the glossopterid group of plant and derivation of its phylogenetic relationships on the basis of cladistic analyses are yet to be validated. Relationship between the families Dictyopteridiumaceae and Eretmoniaceae is discussed. Distribution of various genera of glossopterid fructifications in the Permian of the Gondwana Supercontinent has been tabulated.

Usha Bajpai

Reported biogenic arsenopyrite in Holocene peat sediment in India and biogenic mineral precipitation in peat sediment.

Usha Bajpai & Anjum Farooqui

Some new fossil woods have been identified from the Mio-Pliocene sediments of Pondicherry (jointly with Dr. N. Awasthi).

J.S. Guleria & Rashmi Srivastava

First draft of "A Catalogue of Indian Tertiary Plants (Megafossils) -1989 to 2001" has been prepared.

Rashmi Srivastava & J.S. Guleria

Studied a fossil leaf, *Phyllanthus mampuiensis* sp. nov. from Mampui area, Chintuipui District, Mizoram (Early Miocene) and finalized the observations.

Anil Agarwal & B.D. Mandaokar

A monograph including study of all the fungal remains known so far from the Indian sediments is being prepared.

R.K. Saxena & S.K.M. Tripathi

A catalogue, including all records of spores and pollen from the Indian Tertiary sediments published after 1988 up to 2000, has been prepared and is being finalized. This will update the earlier catalogue on Indian Tertiary spores and pollen (Saxena 1991), which includes spore-pollen records published up to 1988.

R.K. Saxena & G.K. Trivedi

Carried out studies on dispersed organic matter from the Neogene and Pleistocene sediments of the Site 218 of the Leg 22, Bengal fan, Indian Ocean.

Madhav Kumar, R.K. Saxena & Anil Chandra

An Early Lutetian dinocyst assemblage has been recorded from the Baratang Formation of Andaman-Nicobar Islands. The assemblage contains stratigraphically significant dinocyst taxa, viz., *Enneadocysta arcuatum*, *Deflandrea phosphoritica*, *Operculodinium exquisitum*, *Palaeocystodinium hampdenense*, *Homotryblum oceanicum*, *Homotryblum tenuispinosum* and *Achomosphaera multifurcata*. A manuscript on the aspect is finalized.

Samir Sarkar, J.P. Mandal & Anil Chandra

Critical morphotaxonomic evaluation of some selected pteridophytic spores has been carried out in connection with the preparation of a pteridophytic spore atlas. The following taxa have been studied at specific level giving emphasis on morphologic circumscription of the taxa and stratigraphic distribution: *Foveosporites* (14 species) *Foveotriletes* (6 species) and *Dandotiaspora* (9 species).

J.P. Mandal & Samir Sarkar

Carried out cuticular studies on compressions of Pliocene-Pleistocene age from West Kameng District (Arunachal Pradesh) and of Oligocene age from Makum Coalfield (Assam), and finalized observations regarding structural features, photodocumentation, descriptions and comparison of cuticles from Arunachal Pradesh.

Rajni Tewari

Compiled biopetrological data, accumulated both under normal and fluorescence modes, from Old and New Mine sections of Panandhro Lignite field, Gujarat and finalised two papers on the aspect.

Alpana Singh & B.D. Singh

Finalised a manuscript entitled "Dinoflagellate cysts evidence on the age of Kulakkalnattam Sandstone Member, Garudamangalam Formation, Cauvery Basin". Finalised another manuscript entitled "Re-interpretation of archaeopyle type in *Leberidocysta? Scabrata* (Jain & Taugourdeau-Lantz) Stover & Evitt 1978 and its taxonomic reallocation".

Carried out compilation of stratigraphic records of dinoflagellate cysts from Indian Mesozoic-Cenozoic successions during 1990-2000 period to update the earlier Catalogue on Indian Dinoflagellate Cysts.

Khowaja-Ateequzzaman & Rahul Garg

Prepared project proposal "National Centre for Global Geosphere and Biosphere Change Research" for the Institute.

Chhaya Sharma

Prepared project proposal "Environmental aspects, habitat pattern of early man and dating of sites with Archaeobotanical inputs" jointly with Professor I.B. Singh, Lucknow University.

Chhaya Sharma & K.S. Saraswat

Carried out palynological investigations of yellow rain samples collected from Nirala Nagar locality of Lucknow

during the months of December-January, to reveal the seasonal nectar yielding plants of the region.

Chhaya Sharma & Chanchala Srivastava

Pollen analysis of 6 thick meshes of spider webs collected from different localities of Lucknow was done. Airborne pollen and spores trapped in the webs collected from various situations have turned out to be a good tool equivalent to moss cushions and surface samples studies for evaluating the pollen dispersal and their deposition in a particular region. Manuscript has been finalized on the aspect.

Chhaya Sharma, S.K.Bera & Anjali Trivedi

Completed pollen analysis of two Quaternary samples from Smith, Meghalaya. The pollen assemblage obtained has shown the dominance of grasses together with Asteraceae and Artemisia. Pollen of Impatiens, a moist-loving element, has also been recovered in good frequencies. The arboreals are few and marked by the sporadic pollen of *Lagerstroemia*, *Symplocos*, *Schrebera* and *Oleaceae*. The encounter of pollen of *Pinus*, *Ulmus*, *Betula* and *Alnus* denotes the close proximity of the temperate conifer/broad-leaved forests to the site of investigation.

M.S. Chauhan

A 4.7 m profile (Riyasi) of the Pithoragarh palaeolake, located in the eastern part of Kumaun Lesser Himalaya, Pithoragarh District was studied (in Germany) for magnetic parameters. Overlying the rocks of the Rautgara (slates) and Gangolihat (dolomites) formations, the rocks of the Mandhali Formation are exposed in this area which have been assigned an age of upper Reophien to Vendian. On the basis of magnetic mineralogy, it can be concluded that three different components exist in the Riyasi section (a part of the Wadda-Pithoragarh palaeolakes)- relatively soft magnetic and probably coarse-grained hematite: HEM-C and viscous and probably fine-grained (near to superparamagnetic behaviour) hematite: HEM-F. Cluster analysis was also done to zone the Riyasi section into magnetozones

selecting the magnetic parameters on different data sets of the section.

There have been four major regional tectonic activities in the Himalaya in the past 40 ka BP- i) ~35-40 ka BP, ii) ~20-21 ka BP, iii) ~8-10 ka BP and iv) ~1-3 ka BP. These were responsible for the formation of the lakes by blocking the drainage and again by draining them off due to the revival of the tectonic activity. One such lake- Phulara-Champawat palaeolake, in the Kumaun Lesser Himalaya was formed at ~20 ka BP and was drained at ~2-4 ka BP. The magnetostatigraphic, mineral magnetic, clay mineralogical, isotopic and palynological studies of this palaeolake date reveal 3 humid phases and 4 arid phases in the Kumaun Himalaya since 20 ka BP. The LGM, Older Dryas, Younger Dryas and Holocene warming are well documented in the Phulara Section.

Binita Phartiyal

Studied already collected rock samples during past field excursions in various parts of Ladakh and eastern Karakoram region. Submitted final report of research to the authorities at the BSIP with a request to forward it to the CSIR. Revised and resubmitted five research papers to different national and international journals.

Collected Ganges River sand from several localities between Kanpur and Dev Prayag under an international project "Dating zircons from the world's major river". Samples are now being analysed at the geochronological laboratory at the Australian National University, Canberra, by using Excimer Laser Ablation-ICPMS technique. Results are awaited. Also participated in a field excursion in the Kumaun Lesser Himalaya with the Director, BSIP and collected black shale samples from Bir-Bhatti area for maceration and to see the presence of palynomorphs in these samples.

Rajeev Upadhyay [Sr. Research Associate (Pool Scientist, CSIR, up to March 19, 2002)]

Prepared a document for setting up a Geochemical Laboratory in the Institute. Contributed on varied aspects of geochemical and geochronological studies in the preparation of project proposal for X Five Year plan. Discussed with some scientists of the Institute about the importance of geochemical data input in palaeobotanical studies and prepared state-of-the-art document.

Anupam Sharma

Collaborative Work

A monograph on the stromatolite genera recorded in India and Russia entitled "Precambrian microbiota of India and Russia" has been completed under Integrated Long Term Programme of Co-operation in Science and Technology (ILTP) between Russian Academy of Sciences and DST, Government of India.

**A.K. Sinha & Mukund Sharma [& M.E. Raaben
(GINRAS, Moscow, Russia)]**

Studied organic walled microfossils from the chert nodules associated with black shales of Infra-Krol succession, Nainital syncline, Lesser Himalayas exposed in the Manora-Hanumangarhi track. The recovered assemblage comprised acritarchs and cyanobacterial remains. The acritarchs belong to sphaeromorphida and sphaerohystrichmorphida groups. Cyanobacterial remains represented by both colonial forms as well as septate and aseptate trichomes and few VSM indicate Neoproterozoic age.

**Manoj Shukla & Rupendra Babu [& Sri V. K.
Mathur (GSI, Northern Region, Lucknow)]**

Collected statistical data of all the varieties of leaves of the genus *Buriadia* based on 55 specimens showing 862 leaves. This study is carried out under a collaborative project on Gondwana conifers.

**Shaila Chandra & K.J. Singh [& Prof. Gar
Rothwell & Dr. Gene Mapes (U.S.A)]**

Studied variation in leaf morphology of *Murraya paniculata* in relation to air pollution. SEM investigation shows striations present on the epidermal cells and some trichomes in polluted plant whereas it is absent in healthy plants. This plant has been described as pollution tolerant even though it shows some abnormal cuticular features.

Usha Bajpai [& Prof. C.L. Verma (Lucknow)]

Sequel to the partial degradation (with 2-aminoethanol; duration 48 hours + 1% KMnO_4 ; duration

24 hours at 30°C) of leaf cuticle of *Cycas rumphii*, the biopolymer structure is discovered. TEM studies revealed several kinds of biopolymer organisation. A new and unexpected quasi-crystalloid biopolymer network is noticed and a negative regular pentagon is observed. The quasi-crystalloid biopolymer symmetry, well-established in the ectexines of different taxa of gymnosperms and angiosperms, are now demonstrated in cuticle by the observations made during the present studies.

Different experiments were carried out on pollen grains of *Cycas rumphii* with use of 2-aminoethanol, KMnO_4 aq. dil. and merkaptoethanol. Alterations in morphology of these pollen are observed with the help of Light microscope and the superficial degradation is studied with SEM. Ultrastructure of partially degraded exine with 2-aminoethanol and KMnO_4 is investigated with a view to observe the changes or alterations. Ultrastructural studies reveal that no further thinning or reduction in ectexine is noticed in apertural area of pollen. Very complex molecular structures represented in quasi-crystalloid and quasi-equivalent systems are also observed.

**S.K.M. Tripathi & Madhav Kumar [& Professor
M. Kedves, (Hungary)]**

The study of a few compressions collected from the Pleistocene sediments of Kameng District, Arunachal Pradesh was finalized.

R.C. Mehrotra [& Dr. Ashutosh Joshi (GSI)]

The isotopic study on the paleosol samples collected from Siwalik sequence of Suraikhola area has been done. This sequence has several geological and geographical markers, which allowed to tie our sample location with the available palaeomagnetic dates. The Oxygen Isotope analysis indicated that $\delta^{18}\text{O}$ (PDB) value of sandstone cement ranges from -17-7‰. Up to 8 Ma year the oxygen isotope shows depleted value with scatter (-17 to- 12‰). After 8 Ma $\delta^{18}\text{O}$ shows continuous enrichment up to 5 Ma and then it shows a constant value around -7‰. Depleted and scattered oxygen isotopes

value in the lower stratigraphic level may be due to high temperature cement because very coarse sparite in fracture and filling large voids are not common in Siwalik groups. But as after 8 Ma the $\delta^{18}\text{O}$ show continuous enrichment trend with less scattered value. This change in $\delta^{18}\text{O}$ value in carbonate cement definitely indicates the change in isotopic composition of ground water and hence the palaeoprecipitation. This observation of change in precipitation actually corroborates with the lithological association. The dominance of flood flow around 8 Ma shows monsoon climate, which would cause frequent seasonal flood flow.

The Hydrogen isotope analysis has also been carried out from the separated clay fraction, following the method used by Savin and Epstein (1970). The data shows a clear enrichment of hydrogen isotopic value with decreasing age but before drawing any conclusion quantitative analysis of the clay fraction is needed to find out the relative contribution in d D from each clay species. A systematic collection of paleosol samples (about 270) from Lower and Middle Siwaliks of Purniyagiri section near Tanakpur, Uttaranchal has also been made for isotopic analysis.

Mahesh Prasad [& Dr S.K. Bhattacharya & P. Sayal (PRL, Ahmedabad)]

Investigated plant megafossils mainly leaf impressions collected from Siwalik sediments of Seria Naka and Jarva area in the foot-hills of Uttar Pradesh.

Mahesh Prasad [& Dr. P.P. Tripathi (Balrampur)]

Finalized palynological work on the Siwalik Group of rocks exposed in the Arjun Khola and its adjoining areas. Nine palynoassociations have been recognized in the succession, which have been interpreted in term of vegetational as well as palaeoclimate changes against a chronostratigraphic control based on the magnetostratigraphic study. A definite change of climate at about 5.1 Ma-5.2 Ma or slightly latter is indicated from wet evergreen to moist deciduous forest in the area.

S. Sarkar [& G. Corvinus (Nepal Research Center, Kathmandu, Nepal)]

Completed a manuscript on Early Campanian nanofossils highlighting the stratigraphical and palaeoenvironmental significance within the sequence stratigraphical framework. The nanofossils have been recovered from the sandstone unit (?Lameta Formation), overlying the coralline limestone/marl of the Bagh Formation and underlying the Deccan Traps, exposed in Chakrud, near Zeerabad, Bagh area.

Nannofossil documentation of Oligocene age (NP-21 of Martini, 1971) was carried out both under light microscope and SEM. They were recovered from glauconitic marls present in the lower part of the type section of Maniara Fort Formation, which are overlain by hard calcareous dirty yellow to chalky coralline bioherm bearing limestones from Kachchh, located near Maniara Fort village. The cosmopolitan nanofossils marker taxa in the assemblage are *Cyclococcolithus formosus*, *Helicosphaera reticulata*, *Sphenolithus predistentus*, *Reticulofenestra umbilica* etc. The assemblage is dominated by small reticulofenestrids.

Jyotsana Rai & Rahul Garg [& Prof. S. Kumar (Lucknow University)]

A paper entitled "A 36,000- year climatic record and neotectonics in the Kumaun Himalaya, India" has been finalized.

Chhaya Sharma [& Dr B.S. Kotlia (Kumaun University, Nainital)]

Carried out pollen analysis of 6 samples from sedimentary core procured from Sambhar Salt Lake, Rajasthan. Preliminary studies of 3 productive samples from different depths 2.98-3.00 m, 12.12-12.14 m and 12.14-12.16 m have revealed open-type vegetation, dominated by grasses followed by sedges, Asteraceae, Chenop/Ams, Urticaceae, Polygonaceae, etc. Arboreal vegetation is represented by *Holoptelea*, *Zizyphus*, *Terminalia*, members of Fabaceae, Euphorbiaceae, etc. *Potamogeton*, *Typha*, *Myriophyllum*, etc represent aquatic vegetation.

Chhaya Sharma [& Dr R. Sinha (IIT Kanpur)]

A 4.4 m deep marine core from Nizampatam Bay (West Bengal) was palynologically investigated. Studies have revealed the palaeovegetation history of last 5500 yrs.. It covers three transgression phases- 5500, 3850 and 1950 yrs B.P. and two regression phases- 4250 and 2300 yrs B.P.

Chhaya Sharma [& P.C. Srivastava (GSI, Kolkata)]

Accomplished the work on surface samples from Antarctica and finalized a paper entitled "Modern pollen-spore contents in surface samples from Priyadarshini Lake site in East Antarctica".

Chhaya Sharma & S.K. Bera [& Dr D.K. Upreti (NBRI, Lucknow)]

Accomplished the work on Sanai Tal and finalized a paper entitled "Proxy records of Holocene vegetation and climate change from Sanai Tal, Central Ganga Plains, Uttar Pradesh". Completed the pollen analysis of 2.3 m deep sedimentary profile from Basaha Jheel, Unnao (UP) with an objective to reconstruct the palaeovegetational changes and corresponding climatic fluctuations in the Gangetic plain during the Holocene. Six distinct pollen zones have been recognized for the Central Ganga plain region covering early Holocene period. Work is in progress. Started chemical processing of another sedimentary profile from Misa Tal, Lucknow. Preliminary studies have shown good pollen preservation.

Chhaya Sharma & M.S. Chauhan [& Prof. I.B. Singh (Lucknow University, Lucknow)]

Based on the increasing clinical records of patients suffering from house-dust-allergy, a project proposal entitled "Studies of dust mites in the houses of asthmatic patients in Lucknow City and adjoining areas" was prepared and submitted to CST, U.P., Lucknow. The project has been approved and will be implemented very soon.

Asha Khandelwal [& Dr. Rajendra Prasad (KGMC, Lucknow)]

Palynological studies have been made in an above 100 m long profile from Lamayuru palaeo lake, Ladakh which brought out the vegetation vis a vis climatic changes during the last glacial period. This study shows the continuation of prevailing semi arid climate with minor fluctuations towards increased precipitation since last 35000 year BP

A. Bhattacharyya & P.S. Ranhotra [& Dr. B.S. Kotlia (Nainital)]

Work is underway in connection to the coastal morphology based on radiocarbon dating and palynological studies.

G.Rajagopalan & Supriya Chakraborty [& Dr. K.P.N. Kumaran (ARI, Pune)]

Sponsored Projects

Project : The transition of lacustrine fauna and floral Communities across Pleistocene - Holocene in Jammu and Ladakh (Sponsored by DST, New Delhi, No. DST / ESS / CA / A4 - 22/96)

Fourteen surface samples were analysed for pollen investigation from the vicinity of two lakes- Surinsar and Mansar. Finalized a paper entitled "Modern pollen/spore rain in Surinsar and Mansar Lakes, Jammu". Scanning analysis of 30 m deep sedimentary core retrieved from the bottom of the lake below 5 m water column of Mansar Lake, situated about 60 km from Jammu revealed a rich pollen assemblage throughout the column, except for the silty sand samples (at 16.60 m depth), which are barren. Constructed pollen-diagram based on pollen analysis of 19 samples at an interval of 1 m can be arbitrarily divided into four pollen assemblage zones on the basis of changes witnessed in the changed vegetation pattern for interpreting the inferred climatic fluctuations:

Zone I: (30-25 m depth) *Quercus*, *Ulmus*, *Alnus*, *Betula*, *Pinus*, *Artemisia*, Poaceae Assemblage-vegetation during this early phase (14C date 8530 ± 130 yrs BP at 29 m depth) is depicted mainly by mixed broad-leaved forests. *Pinus* though sparsely distributed but occupied most probably the sunny hill slopes not far from the lake site. Ground vegetation mainly underneath the forest stands comprised predominantly the grasses, followed by other associates, such as *Artemisia*, sedges, Chenop/ Ams, Asteraceae, Urticaceae, ferns etc. The emerging overall composition reflects warm and moist conditions in the region.

Zone II: (25-23m depth) *Quercus*, *Pinus*, *Betula*, *Artemisia*, Poaceae Assemblage-mixed Oak forests though continued to grow, around 7000 yrs BP, but turned less dense as evidenced by decline in *Quercus*, and its associates namely *Alnus*, *Ulmus* with a simultaneous increase in *Pinus* pollen frequency. Such a change in the vegetation mosaic demonstrates that the climate turned less moist than before.

Zone III: (23 - 21m depth) *Pinus*, Poaceae Assemblage- around 5000 yrs BP considerable decline in *Quercus* and Poaceae is witnessed with simultaneous marked increase in the values of *Pinus*. Replacement of

Oak dominated forests by Pine dominated forests characterize this phase. Marked change in the vegetation signifies that climate became much warmer and drier.

Zone IV: (21m- recent) *Pinus*, *Quercus*, Poaceae Assemblage- *Pinus* continued to dominate during this zone but with continuous slight increase in the values of *Quercus* along with other associates, such as *Betula*, *Carpinus*, *Corylus*, *Ulmus* and Poaceae. Change in vegetation pattern reflects amelioration in the climate towards warm and humid conditions in the region.

Chhaya Sharma & Anjali Dixit [& M.A. Malik (Jammu University, Jammu)]

Project : High altitude plant species response to global climate change. (Sponsored by G.B. Pant Institute of Himalayan Environment and Development Kosi-Katarmal, Almora, Department of Environment, New Delhi, No. GBPI/IERP/98-99/02/567)

Prepared a pollen depositional model through the study of 15 moss polsters, forest humus and sub surface soil samples to understand the pollen/vegetation relationship in and around the Valley of Flowers (Nanda Devi Forest Division). The pollen assemblage more or less coheres with extant vegetation and the database will provide valuable information toward the accurate interpretation of pollen diagram in time and space. Collected three sediment profiles (80-100 cm) from the Valley of flower, Garhwal Himalaya which were radiometrically dated as 670 ± 80 - 1020 ± 140 years BP. The construction of pollen diagram and detailed palynostratigraphical studies are in progress.

Studied tree-ring samples of *Taxus baccata* from Yamnotri for tree-growth climate relationship. A ring-width chronology of 345-years (AD 1656-2000) is prepared. The chronology showed indirect relationship with March-June mean temperature. The chronology is further studied to see its relationship with other chronologies prepared from the adjacent regions. Occurrence of significant relationship with *Abies* ring-width chronologies prepared from adjacent areas shows that the *Taxus* chronology could be important constituent

of tree-ring data network for the development of robust climatic reconstructions. The tree-ring samples of *Abies pindrow* collected from Yamnotri are being crossdated to develop ring width chronologies.

R.R. Yadav, S.K. Bera & Jayendra Singh

Project : Analysis of climatic changes and glacial fluctuations using pollen and tree-ring data, in Gangotri Glacial area, Garhwal Himalayas. (Sponsored by DST, New Delhi, No. ES/91/018/97)

Completed pollen analysis of a 1.30 m deep profile covering entire Holocene from a Kame terrace at Bhujbas near Gangotri Glacier. The study shows that around 9000 yrs. B.P., climate was warm-moist when *Betula*, *Salix*, *Pinus*, *Cedrus* and other Conifers used to grow in the vicinity of the site. These elements declined around 8300-7600 yrs B.P. when climate became cooler. The increase of *Betula*, *Salix* and decline in *Ephedra* and *Cheno/Ams* indicates that climate around 7000-6000 yrs. B.P. became warm-moist. Subsequently, after 6000 yrs. B.P. and onwards the decline in pollen /spore percentage of *Betula*, *Salix*, *Alnus*, Conifers, Ferns and aquatics, and increase in *Ephedra* and *Cheno/Ams* is suggestive of comparatively drier climate. Around 1000 yrs. B.P. there might be a comparatively colder phase when *Betula*, *Salix*, Conifers decline with the increase in *Ephedra* and *Cheno/Ams*. Isotopic analysis ($\delta^{13}C$) for organic contents of this profile is also made (in collaboration with Prof. I.B Singh, Lucknow). Interpretation of data is in progress

In addition of magnetic susceptibility studies of a large number of samples from eight different profiles around Gangotri Glacier were completed (in collaboration with Dr N. Bashvaiah, Mumbai). The results are very promising and the detailed analysis of these results for the interpretation of climatic changes is in progress.

Tree-rings of *Pinus wallichiana* growing around Chirbasa was dated. The counting and dating of the tree rings of other trees around Gangotri region, viz. *Pinus roxburghii*, *Cedrus deodara* and *Betula utilis* are in progress.

A. Bhattacharyya, Ratan Kar (up to May 2001) & P.S. Ranhotra

Project : Analysis of climate changes in Eastern Himalayan region using tree ring data. (Sponsored by DST, New Delhi, No. ESS/44/01/98)

Completed dating and measurements of all tree-ring samples of *Pinus kesiya* growing around Shillong Plateau, Meghalaya. Total 9 chronologies have been developed out of which five are of *P. kesiya* and four are of *P. merkusii*. The longest chronologies of these two species dates from 1859-2000 AD and 1705-1999 AD, respectively. Relationship of tree growth/ climate and seismic events are in progress. Dating of samples of *Tsuga dumosa* and *Pinus wallichiana* is in progress. One of the sediment profiles from Ziro, Arunachal Pradesh was macerated and the pollen counting is in progress. C-14 date shows these sediments to be above 40, 000 yrs. B.P.

A. Bhattacharyya & Vandana Chaudhary

Project : Cretaceous megafloral and coprolitic-derived plant assemblage from the Deccan Trap associated sedimentary sequences in the Dongargaon, Pisdura area Maharashtra (DST No. ESS/23/VES/114/2000 dated July 05, 2001).

Carried out detailed study on *Spermatites* from the Deccan intertrappean beds of Padwar and ascertained its affinities with *Azolla*. The manuscript pertaining to this was revised for publication. Undertook field work in central India and Maharashtra State and collected fossil materials (coprolites along with araucarian cones, leaf-fragments and *Chara* embedded in calcareous rocks) from Lameta Formation. Preliminary studies of coprolites could show the presence of fungal spores, bacteria and gymnospermous pollen. Some gymnospermous cuticles are also recovered. Presence of *Aulacosira*, a fresh water diatom have also been reported.

K. Ambwani [& R.K. Kar]

Project : Tree-line dynamics in highland Himalayas, Himachal Pradesh (sponsored by DST, New Delhi, No. 65/SERC/99 dated 15/3/99)

Collected tree-ring samples of *Pinus wallichiana* from different areas around Manali. The samples have been processed for crossdating of ring width sequences.

R.R. Yadav

Project : Palynological, biopetrological and dispersed organic matter (DOM) study of Deccan Intertrappean sediments with reference to Cretaceous-Tertiary (K-T) transition. (DST No. SR/FTP/ES-51/2000)

Conducted field studies on the Deccan intertrappean sediments around Shahpura, Mandla, Dindori, Ranipur and Padwar areas in Madhya Pradesh. Thick sections were observed at Barodi village (Shahpura) and at Mahadwani along the Narmada river. Lithlogging and sample collection was undertaken. Maceration of samples from all the above localities has been completed. Further studies are continuing.

Chert and volcanic ash samples from the Lalitpur (UP) intertrappean beds were analysed (jointly with R.S. Singh). The assemblage recovered is characteristic of Late Palaeocene marker taxa- *Dandotiaspora dilata*, *D. pseudoauriculata*, *D. plicata*, *Lakiapollis ovatus* and *Spinizonocolpites echinatus*. An interesting finding pertains to the discovery of paraphyses of *Acrostichum aureum*, for the first time from intertrappean sediments. The presence of *Acrostichum*, a mangrove fern, indicates that the depositional environment was influenced by brackish water conditions or was marked by some degree of salinity. The intertrappean sediments exposed near Naskal, Andhra Pradesh, were also palynologically analysed. Initial studies have revealed the presence of *Triporoletes*, *Gabonisorites*, *Aquillapollenites*, *Mulleripollis*, *Ariadnisorites*, *Azolla*, *Matanomadhiasulcites*, *Tricolporites* and other Maastrichtian marker species.

Ratan Kar

Recognition

A.K. Sinha

Awarded the “Millennium Medal” of the Cell Biological and Evolutionary Micropaleontological Laboratory, Szeged University, Szeged, Hungary for the year 2002.

Convener, 17th Himalaya-Karakoram-Tibet Workshop, Gangtok, Sikkim, India held during March 2002.

G.P. Srivastava

Presided one of the scientific sessions of “National Symposium on Plant Diversity and Biotechnology” held at Patna University in October, 2001.

Archana Tripathi

The Poem “Garbh Shakti” is judged best among Hindi poems in a competition “Poetry in Science” organized by Professor D. Balasubramanian, Hyderabad and is published in *Current Science* 82.



Prof. M Kedvis honours the Director, BSIP Prof. AK Sinha with Millennium Medal of the Cell Biological and Evolutionary Micropaleontological Laboratory, Szeged University, Szeged, Hungary for the year 2002.

Usha Bajpai

Chaired a Technical Session at XXV Annual Conference of the Electron Microscope Society of India held at IIT, Mumbai.

B.K. Misra

Awarded “Iyengar-Sahni Medal-2001” for the best research paper published in the *Palaeobotanist*, 1999-2000.

Samir Sarkar

Awarded “Dr. P.N. Srivastava Medal-2001” for the best piece of research work done in the Institute during 1998-2000 (Scientist– D category).

Key-note speaker at 18th Indian Colloquium on Micropalaeontology and Stratigraphy held at Nagpur during January, 2002.

S.C. Srivastava

Chaired a Scientific Session at Indian Botanical Conference held at Osmania University, Hyderabad in November, 2001.

S.K.M. Tripathi

Awarded the “Millennium Medal” of the Cell Biological and Evolutionary Micropaleontological Laboratory, Szeged University, Szeged, Hungary for the year 2001.

Alpana Singh

The Poem “Srishti” is judged best among Hindi poems in a competition “Poetry in Science” organized by Professor D. Balasubramanian, Hyderabad and is published in *Current Science* 82.

Rajeev Upadhyay

Elected Fellow of the Geological Society of India, Bangalore.

Representation in Committees/ Boards

A.K. Sinha

- ◆ Chairman, National Committees of the International Lithosphere Program.
- ◆ President, Earth Sciences System for 89th Session of Indian Science Congress, Lucknow.
- ◆ Project-Investigator, International Long Term Programme, Indo-Russian Projects under DST.
- ◆ Chief Editor, "The Palaeobotanist".
- ◆ Member, Local Advisory Committee, Regional Science Centre, Lucknow.
- ◆ Member, Scientific Advisory Committee, Research and Development Aspects of Conservation, Ministry of Human Resource Development, Government of India.

Jayasri Banerji

- ◆ Vice President, The Palaeobotanical Society, Lucknow.

Shaila Chandra

- ◆ Co-ordinator, Contact Course on Advanced Training in Palaeobotany, BSIP
- ◆ Co-ordinator, International Project "Gondwana Alive", South Africa.

K.S. Saraswat

- ◆ Member, Editorial Board, 'Ethnobotany'.
- ◆ Member, Research Degree Committee (Botany), H.N.B. University, Srinagar, Garhwal.
- ◆ Member, Executive Committee, Indian Society for Prehistoric and Quaternary Studies, Pune.

Chhaya Sharma

- ◆ Vice-President, International Council of Biodeterioration of Cultural Property.
- ◆ Member, Advisory Committee, Journal of Bengal Natural History Society.
- ◆ Councilor, Executive Council, The Palaeobotanical Society.

- ◆ Member, National Advisory/Organizing Committee International Conference on Quaternary Climate, Tectonics and Environment of the Himalaya: Comparison with other regions, Nainital (2002).

K. Ambwani

- ◆ Treasurer, Executive Council, The Palaeobotanical Society.

Rahul Garg

- ◆ Member, Editorial Board, Journal of the Palaeontological Society of India.
- ◆ Editor, *Geophytology*.

J.S. Guleria

- ◆ Editor, "Geophytology".
- ◆ Member, Executive Council LUBDAA.

R.K. Saxena

- ◆ Secretary, The Palaeobotanical Society, Lucknow.
- ◆ Member, Editorial Board, *Geophytology*.
- ◆ Secretary and Member, Editorial Board, Indian Society of Geoscientists.

A.K. Srivastava

- ◆ Chief Editor, The Palaeobotanical Society.
- ◆ Member, Advisory Board, Journal *Neo Botanica*.
- ◆ Member, Advisory Committee, Journal *Vasundhara*.
- ◆ Member, Editorial Board and Treasurer, Indian Society of Geoscientists.
- ◆ Member, National Working Group, IGCP-411 - Geodynamics of Gondwanaland derived terranes in East and South Asia.
- ◆ Course Co-coordinator, Contact Course on Advanced Training in Palaeobotany, BSIP.

G.P. Srivastava

- ◆ Vice-President, Museum Association of India.

Archana Tripathi

- ◆ Member, Jurassic Microfossil Group, International Subcommission on Jurassic Stratigraphy.
- ◆ Member, Acritarch Subcommission.
- ◆ Member, Spore pollen Working Group, CIMP.
- ◆ Editor, Quarterly Journal of Geological Association and Research Centre.

Vijaya

- ◆ Corresponding Member, Committee for Quantitative Stratigraphy.
- ◆ Voting Member, International Commission on Triassic Stratigraphy.
- ◆ Member, National Working Group IGCP Project-434— Land ocean interaction during Cretaceous in Asia.

Usha Bajpai

- ◆ Judge, Best Poster Award, and Best Micrograph Award, Annual Conference Electron Microscope Society of India, IIT Mumbai.
- ◆ Judge, Debate Competition, Children Science Congress, Lucknow.
- ◆ Member, Executive Committee, Electron Microscope Society of India.
- ◆ Member, Managing Council, Indian Association of Palynostratigraphers.
- ◆ Member, Technical Advisory Committee of U.P. Environmental Concern.

B.K. Misra

- ◆ Member, Bureau of Indian Standards, Solid Mineral Fuels Sectional Committee— PCD— 7.
- ◆ Joint Secretary, Indian Society of Geoscientists.

C.M. Nautiyal

- ◆ General Secretary, NCSC-UP.
- ◆ Chief Advisor, Uttaranchal Development Activity Institute, UDAI, Dehradun.
- ◆ Co-ordinator, 'Science For School Children' session during 89th Science Congress, Lucknow.

- ◆ Convenor, NCSTC-Network, New Delhi.

M.R. Rao

- ◆ Joint Secretary, The Palaeobotanical Society, Lucknow.

Rakesh Saxena

- ◆ Associate Member, ICCP.

S.C. Srivastava

- ◆ Member, IOP Sahni Medal Committee.
- ◆ Hon. Member, Palaeobotany Botanical Society of America.

Asha Gupta

- ◆ Member, Executive Council, Scientist's Unique and Researcher's Yare Association.
- ◆ Member, Board of Editors, "*Flora & Fauna*".

B.N. Jana

- ◆ Member, Executive Council, The Palaeobotanical Society.

Jyotsana Rai

- ◆ Member, Jury 8th District level National Children's Science Congress, Lucknow.

A. Rajanikanth

- ◆ Assistant Editor, *The Palaeobotanist*.

Mukund Sharma

- ◆ Assistant Editor, *The Palaeobotanist*.

Rajni Tewari

- ◆ Member, National Working Group, IGCP— 411 – Geodynamics of Gondwanaland derived terranes in East and South Asia.

Lectures Delivered

By Institute's scientists outside:

Shaila Chandra

- ◆ *Permian plant sequence in India*, Teacher of Refresher Course, Botany Department, Lucknow University, Lucknow.

K.S. Saraswat

- ◆ Harappan Economy addressed to the students of Post-Graduate Diploma in Archaeology, Institute of Archaeology, New Delhi, at the Circle Office of Archaeological Survey of India, Lucknow (July 9, 2001).

Chhaya Sharma

- ◆ *Palaeoclimatic inferences from Quaternary lacustrine sediments from Kumaun Himalaya-A Review* (invited talk) at Kumaun University, Nainital (March 11, 2002).

A.K. Srivastava

- ◆ *Fossil Bryophytes from India* (invited lecture) at World Conference of Bryophytes held at NBRI, Lucknow (January 25, 2002).

G.P. Srivastava

- ◆ *Angiosperm Taxonomy* a series of 12 lectures to the M. Sc. Plant Sciences students of Department of Botany, Lucknow University (between May-August, 2001).
- ◆ *New Frontiers in Palaeobotany* at Lucknow Christian College (September 28, 2001).
- ◆ *BSIP and its activities* at Kendriya Vidyalaya, Lucknow Cantonment (February 28, 2002).
- ◆ *Importance of Science Day* at Regional Science Centre, Lucknow (February 28, 2002).
- ◆ *Basics of Palaeobotany* at Botany Department, Lucknow University to the Teachers of Refresher Course.

C.M. Nautiyal

- ◆ *Evolution of Solar System and Comets, Meteors, Asteroids* at Summer School at Jawahar Planetarium, Anand Bhawan, Allahabad. (May 17-18, 2001).
- ◆ *Climate change during the last one lac years or so and predictions for the future* at Rotary Club, Meerut (March 14, 2002).

S. Sarkar

- ◆ *Tertiary vegetation and palaeoclimate of north-western Himalayan region, India: Palynofossils evidence* (Keynote lecture) at "18th Indian Colloquium on Micropaleontology and Stratigraphy, Nagpur (January 2002).

Rajni Tewari

- ◆ *Fossil cuticles – Interface between the plant and the environment* at Physical Research Laboratory, Ahmedabad (January 29, 2002).

By outside scientists in the Institute:

Dr. T.R. Venkatesan

Eminent Scientist in the field of Isotopic Determination, Chennai

- ◆ *K-Ar dating technique and its extension to Ar-Ar dating* (on August 3, 2001)

Professor David L. Dilcher

Florida Museum of Natural History, University of Florida,



Distinguished speaker Prof. David Dilcher

- ◆ *New information about the early Angiosperms and its bearing on their evolution* (on February 7, 2002)USA

Deputation/Training/Study/Visit	Abroad/in	Country
---------------------------------	-----------	---------

Anil Chandra

Visited BGR, Hannover, Germany for three months under Indian National Science Academy-DFG Exchange Programme during March 23, 2000 to June 24, 2001.

G.P. Srivastava

Attend an Annual Conference of Museum Association of India held at Nasik (Maharashtra) during April 2001.

S.K. Bera

Attended a special debriefing session graced by Hon'ble Union Minister of HRD, Prof. Murli Manohar Joshi to honour the participants of 19th and 20th Indian Antarctic Expeditions at INSA, New Delhi on June 18, 2001.

S.K.M. Tripathi

Visited Cell Biological and Evolutionary Micropaleontological Laboratory, Szeged University, Szeged, Hungary under Exchange of Scientists Programme between Indian National Science Academy and Hungarian Academy of Sciences from July 18 to September 30, 2001. During visit, work on partially degraded pollen and leaf cuticle of *Cycas rumphii* is conducted.

A.K. Sinha

Visited Hanoi to attend International Lithosphere Programme Meeting during August 19-31, 2001 as Chairman, Committee of National Representatives. Participated in the Joint Scientific Assembly of International Association of Geomagnetism and Aeronomy (IAGA) and International Association of Seismology and Physics of the Earth's Interior (IASPEI) hosted by Hanoi Institute of Geophysics, National Centre for Natural S&T of Vietnam and presented ILP National Annual Report-2000 (Report 25).

A. Bhattacharyya

Attended and presented the project proposal entitled "*Reconstruction of palaeoclimate using pollen and tree ring data in Dokriani Bamak glacier area, Garhwal Himalayas*" for the approval of funding from DST before PAC-ES Committee held at WIHG, Dehradun from August 20-21, 2001.

Binita Phartiyal

Visited Institute of Geology and Palaeontology, University of Tuebingen, Germany from November 18 to December 10, 2001 to study the continuation of the work entitled 'Use of mineral magnetic parameters to decipher environmental and climatic changes in the Quaternary palaeolakes of Lesser Himalaya' under the UGC/DAAD exchange programme (during October 1999 - September 2000).

Attended a post-conference field excursion in March, 2002 (guided by Prof. K.S. Valdiya) around Nainital. The Siwalik exposures of the Ranibagh-Kathgodam transect, Amritpur Granite (1800ma old), Quaternary palaeolake deposit of Bhimtal-Naukuchiatal, upliftment in the fluvial terraces were some of the sites visited during the field excursion.

R.R. Yadav

Attended Project Advisory and Monitoring Committee Meeting on MONTCLIM and ICRP held at Indian Institute of Tropical Meteorology, Pune during November 21-22, 2001 to present the project proposal "*Climate variability in the Western Himalaya*".

Jyotsana Rai

Participated in DST sponsored Contact Programme cum Field Workshop on "Structure, Tectonics and Mesozoic Stratigraphy of Kachchh" held at Bhuj from January 14-20, 2002. The programme was organised by Department of Geology, Maharaja Sayajirao University, Baroda.

Anil Agarwal & Rajni Tewari

Visited PRL, Ahmedabad during January 27-31, 2002 on the invitation of Professor D. Lal and delivered a lecture highlighting the findings of dispersed leaf cuticles from Sindhudurg Formation (Miocene Age) Ratnagiri District (Maharashtra).

Puneet Bisaria

Attended 46th half-yearly Meeting of NARAKAS held at CDRI, Lucknow on August 13, 2001.

Puneet Bisaria & Ajay K. Srivastava

Attended *Computer Training Programme in Hindi* sponsored by NIC, CMC Ltd. and ER and DCI held at NIC, Lucknow from November 5-9, 2001.

K.S. Saraswat

Attended 47th half-yearly Meeting of NARAKAS held at CDRI, Lucknow on February 26, 2002.

T.K. Mandal

Visited the Geochronology unit of the GSI, Kolkata in connection with the establishment of Radiocarbon Laboratory, and provided technical support to fabricate a high vacuum glass system for sample combustion, hydrolysis, acetylene preparation, benzene extraction and various methods of sample processing for C-14 dating were discussed.

Deputation to Conferences/Symposia/Seminars/Workshops

A.K. Sinha

- ◆ *16th Himalaya-Karakoram-Tibet Workshop* held at Graz Schloss, Austria from April 3-5, 2001.

R.C. Mehrotra

- ◆ *International Conference on the Climate and Biota of the Early Paleogene* held at Powell, Wyoming, USA from July 3-8, 2001.

Anjum Farooqui

- ◆ *6th International Conference on Biogeochemistry of Trace Elements* held at University of Guelph, Ontario, Canada from July 29- August 2, 2001.

A.K. Ghosh

- ◆ *7th International Phycological Congress* held at Aristotle University of Thessaloniki, Thessaloniki, Greece from August 18-25, 2001.

G.P. Srivastava

- ◆ *National Symposium Plant Diversity and Biotechnology* held at Patna University, Patna from October 9-10, 2001.

A.K. Sinha, Chhaya Sharma & Amalava Bhattacharyya

- ◆ *National Symposium on Role of Earth Sciences in Integrated Development and Related Societal Issues* held at GSI, Lucknow from November 1-3, 2001.

Asha Khandelwal

- ◆ *5th International Conference on Biodeterioration of Cultural Property* held at Sydney, Australia from November 12-14, 2001.

Majority of the Scientific, some Technical staff and Registrar of the Institute

- ◆ *89th Session of Indian Science Congress* held at Lucknow University, Lucknow from January 3-7, 2002.

Samir Sarkar, M.R. Rao, B.D. Mandaokar & Ratan Kar

- ◆ *XVIII Indian Colloquium on Micropaleontology and Stratigraphy*, held at Department of Geology, Nagpur University, Nagpur from January 14-16, 2002.

A.K. Srivastava & Asha Gupta

- ◆ *World Conference of Bryology* held at National Botanical Research Institute, Lucknow from January 23-30, 2002.

S.C. Bajpai

- ◆ *National Seminar on Energy and Environment* held at Anand Engineering College, Agra, December 21-22, 2001.

Chhaya Sharma, Asha Khandelwal, G.K. Trivedi, Anjum Farooqui & Anjali Trivedi

- ◆ *Second International Conference on Plants and Environmental Pollution (ICPEP-2)* held at NBRI, Lucknow from February 4-9, 2002.

K. Ambwani & Usha Bajpai

- ◆ *XXV Annual Conference of the Electron Microscope Society of India on Electron Microscopy and Allied fields* held at IIT, Mumbai from February 19-22, 2002.

Chhaya Sharma, R.R. Yadav, A. Bhattacharyya, Binita Phartiyal, Vandana Chaudhary & Jayendra Singh

- ◆ *International Conference Quaternary Climate, Tectonics and Environment of the Himalayas: Comparison with other regions* held at Kumaun University, Nainital from March 11-15, 2002.

A.K. Sinha, A.K. Srivastava, Neerja Jha, Ram Awatar, Vandana Prasad, Rajeev Upadhyay & P.S. Katiyar

- ◆ *17th Himalaya-Karakoram-Tibet Workshop* held at Gangtok, Sikkim from March 25-27, 2002.

I.J. Mehra, Puneet Bisaria & S.S. Panwar

- ◆ *Joint Hindi Workshop* held at CDRI, Lucknow from June 27-28, 2001.

Puneet Bisaria

- ◆ *Official Language Conference* held at New India Assurance Company Limited, Lucknow on July 23, 2001.
- ◆ *Hindi Workshop* held at CDRI, Lucknow on March 28, 2002.

Papers presented at Conferences/Symposia/Meetings

- Ambwani K, Sahni A, Kar RK & Debi Dutta** - Oldest occurrence of Diatoms (*Melosira*) from the continental Lameta (Late Cretaceous), India: SEM studies. *XXV Ann. Conf. Electron Microscopy Soc. India*, Mumbai, February 2002.
- Bajpai U & Ambwani K** - Variations in the fruit morphology of the genus *Cyperus*: SEM approach. *XXV Ann. Conf. Electron Microscopy, Soc. India*, Mumbai, February 2002.
- Bajpai U & Bajpai SC** - The solar cell array environment and its effect. *National Seminar on Energy and Environment*, Agra, December 2001.
- Bhattacharyya A & Chaudhary V** - Tree-ring analysis from the eastern Himalayan region-an update. *Int. Conf. Quaternary climate, tectonics and environment of the Himalaya: Comparison with other regions*, Nainital, March 2002.
- Bhattacharyya A, Ranhotra PS & Kotlia BS** - Vegetation and climatic changes around Lamayuru, Trans Himalaya during 35-40 Ka BP. *Int. Conf. Quaternary climate, tectonics and environment of the Himalaya: Comparison with other regions*, Nainital, March 2002.
- Chauhan OS, Malik MA, Sharma C & Suneethi J** - Holocene records of climate variability from Himalayan lake Mansar, India. *Int. Conf. Quaternary climate, tectonics and environment of the Himalayas: Comparison with other regions*, Nainital, March 2002.
- Farooqui A** - Trace metal and mangroves in Tamil Nadu coastal region, India- A case study. *6th Int. Conf. Biogeochem. Trace Elements, Ontario, Canada*, July-August 2001.
- Ghosh AK** - Diversification of the family Sporolithaceae during Cretaceous-Tertiary Period in India. *7th Int. Phycol. Congr., Greece*, August 2001.
- Gupta A** - Spores through Geologic Time. *World Conf. Bryol.*, Lucknow, January 2002.
- Gupta A** - Vegetation and climate in temperate zone, Kumaun Himalaya (Saria Tal) since Middle Holocene. *89th Indian Sci. Congr.*, Lucknow, January 2002.
- Kar R** - Palynological recognition of Barren Measures sediments from Tatapani-Ramkola Coalfield, Chattisgarh, India. *XVIII Indian Colloq. Micropalaeont. Stratigr.*, Nagpur, January 2002.
- Khandelwal A** - Qualitative and quantitative assessment of aerobiopollutants in Chowk, Lucknow, India. *2nd Int. Conf. Plants and Environmental Pollution*, Lucknow, February 2001.
- Khandelwal A** - Sampling and estimate of fungal biodeteriogens of Lucknow, India. *5th Int. Conf. Biodeterior. Cultural Property*, Australia, November 2001.
- Kotlia BS, Sanwal J, Sharma C, Phartiyal B, Pant CC & Rawat KS** - A 21,500-year climatic record and neotectonic in the Kumaun Himalaya, India. *Int. Conf. Quaternary climate, tectonics and environment of the Himalayas: Comparison with other regions*, Nainital, March 2002.
- Mandaokar BD** - Palynology and paleoecological constraints of Middle Bhuban Formation of Lawngtlai, Mizoram, India. *XVIII Indian Colloq. Micropaleont. Stratigr.*, Nagpur, January 2002.
- Mehrotra RC** - Status of plant megafossils during the Early Palaeogene in India. *Int. Conf. Climate and Biota of the Early Paleogene*, Powell, USA, July 2001.
- Misra SN, Trivedi GK & Shukla OP** - Impact of environmental factors on the habitat of *Alectra parasitica* var. *chitrakutensis* near Sphaticshila, Chitrakoot, Satna District, Madhya Pradesh, India. *2nd Int. Conf. Plants and Environmental Pollution*, Lucknow, February 2001.
- Phartiyal B** - 21,000 year climatic record in the Kumaun Lesser Himalayas. *Int. Conf. Quaternary climate, tectonics and environment of the Himalayas: Comparison with other regions*, Nainital, March 2002.

- Prasad V & Sarkar S** - Fossil *Scytonema* (Nostocales) from the Subathu Formation of Tal Valley, Garhwal Himalaya, India. *18th Indian Colloq. Micropaleont. Stratigr.*, Nagpur, January 2002.
- Prasad V & Sarkar S** - Palynology and palynofacies analyses: some essential clues to assess and identify palaeoenvironment of Subathu Formation, Tal valley, Garhwal Himalayas, Uttaranchal. *17th Himalayan-Karakoram-Tibet Workshop*, Gangtok, March 2002.
- Rao MR** - Palynology and palaeoecology of Miocene sediments of Mangalore, Karnataka, India. *XVIII Indian Colloq. Micropaleont. Stratigr.* Nagpur, January 2002.
- Sarkar S** - Tertiary vegetation and palaeoclimate of north-western Himalayan region, India: Palynofossil evidence. *18th Indian Colloq. Micropaleont. Stratigr.*, Nagpur, January 2002.
- Sarkar S** - Palynological evidence of vegetational changes during Miocene-Pliocene (12Ma-2Ma) times in the sub Himalayan regions of Central Nepal. *89th Indian Sci. Congr.*, Lucknow, January 2002.
- Sarkar S & Prasad V** - Palaeoenvironmental significance of fossil *Pediastrum* in the Palaeogene rocks of N.W. Himalayas. *89th Indian Sci. Congr.*, Lucknow, January 2002.
- Sharma C, Chauhan MS & Singh IB** - Holocene vegetation and climate from Sanai Jheel (Ganga Valley plains), Uttar Pradesh. *Nat. Symp. Role of Earth Sciences in Integrated Development and Related Societal Issues*, Lucknow, November 2001.
- Sharma C & Dixit A** - Palaeoclimatic inferences from lacustrine sediments from Mansar Lake, Jammu. *2nd Int. Conf. Plants and Environmental Pollution*, Lucknow, February 2001.
- Singh IB, Srivastava P, Shukla UK, Singhvi AK, Tobschall HJ, Joachimski M, Ramesh R, Rajagopalan G, Sharma Manish, Sharma S, Mitra D, Singh DS, Sharma C & Agarwal KK** - Late Quaternary events in Ganga plain. *Int. Conf. Quaternary climate, tectonics and environment of the Himalayas: Comparison with other regions*, Nainital, March 2002.
- Singh RS & Kar R** - Palynological assemblage from the Lalitpur Deccan Intertrappean bed, Uttar Pradesh, India. *XVIII Indian Colloq. Micropaleont. Stratigr.* Nagpur, January 2001.
- Sinha AK** - Subduction mechanism in the Himalayan-Karakoram mountain. *16th Himalaya-Karakoram-Tibet Workshop*, Austria, April 2001.
- Sinha AK** - Himalayan-Karakoram orogen: Certain key issues. *17th Himalaya-Karakoram-Tibet Workshop*, Gangtok, March 2002.
- Sinha AK, Jha N & Upadhyay R** - Additional information on palynological dating of Chhongtash Formation in eastern Karakoram and its palaeogeographical significance. *17th Himalaya-Karakoram-Tibet Workshop*, Gangtok, March 2002.
- Srivastava AK & Tewari R** - Permian plant fossil assemblages from North East Himalaya, India. *17th Himalaya-Karakoram-Tibet Workshop*, Gangtok, March 2002.
- Srivastava GP** - Floral diversity of Mahuadanr beds Palamu District, Jharkhand. *Nat. Symp. Plant Diversity and Biotechnol.*, Patna, October 2001.
- Upadhyay R** - Evidence of palaeo-seismicity in the India-Asia collision zone, northern Ladakh, India. *89th Indian Sci. Congr.*, Lucknow, January 2002.
- Upadhyay R, Rai J & Sinha AK** - Discovery of the Bathonian-Callovian nannoflora from the eastern Karakoram Block. *17th Himalaya-Karakoram-Tibet Workshop*, Gangtok, March 2002.
- Upadhyay R, Ram-Awatar & Sinha AK** - Discovery of the Late Permian and Early Triassic palynofossils from the Cretaceous trench-slope sediments of the Indus Suture Zone, Ladakh Himalaya. *17th Himalaya-Karakoram-Tibet Workshop*, Gangtok, March 2002.
- Yadav RR & Singh J** - Tree-ring-based spring temperature pattern over the past four centuries in western Himalaya. *Int. Conf. Quaternary climate, tectonics and environment of the Himalaya: comparison with other regions*, Nainital, March 2002.

Contact Course

The Institute organised, for the first time, a Contact Course on 'Advanced Training in Palaeobotany' during October, 2001 with an objective to train young researchers, teachers and professional scientists of academic and commercial organizations. This course was co-sponsored by Oil and Natural Gas Corporation Limited and Jabalpur Administration, M.P. Government. The participating scholars were selected from the following institutions/organizations:

Mr Subhash Bhandari, Dept. of Geology, MS University, Vadodara
 Miss Vandana Chaudhary, (RA), Sponsored Project, BSIP, Lucknow
 Mr B.G. Desai, Dept. of Geology, MS University, Vadodara
 Mrs Anjali Trivedi, (JRF), Sponsored project, BSIP, Lucknow
 Miss Devi Dutta, (JRF), Sponsored Project, BSIP, Lucknow
 Miss Anjali Gupta, Dept. of Geology, Lucknow University, Lucknow
 Dr R.K. Gupta, Dept. of Botany, Lucknow University, Lucknow
 Dr B.R. Jha, PG Dept. of Geology, Ranchi University, Ranchi
 Dr Ratan Kar, (RA), Sponsored Project, BSIP, Lucknow
 Mr Shyam Kishore, Dept. of Botany, Lucknow University, Lucknow
 Mr Rakesh Kumar, KDMIPE, ONGC, Dehradun
 Mr Shalabh Kumar, Dept. of Botany, Allahabad University, Allahabad
 Mr O.N. Maurya, Dept. of Botany, Lucknow University, Lucknow
 Mr P.C. Mishra, Dept. of Botany, Allahabad University, Allahabad
 Dr P.K. Misra, Dept. of Botany, Lucknow University, Lucknow
 Mr L Phor, KDMIPE, ONGC, Dehradun
 Mr K.S. Raj, Dept. of Botany, Allahabad University, Allahabad
 Mr Ram San, KDMIPE, ONGC, Dehradun
 Dr U.K. Shukla, Dept. of Geology, Kumaun University, Nainital

Mr Radhe Shyam, KDMIPE, ONGC, Dehradun
 Miss Aradhana Singh, Dept. of Geology, Lucknow University, Lucknow
 Mr S.K. Singh, Dept. of Botany, Lucknow University, Lucknow
 Dr Satyendra Singh, Govt. Degree College, Lansdowne, Jaiharikhal, Pauri
 Dr Rajeev Upadhyay, Pool Scientist (CSIR), BSIP, Lucknow

The course programme was designed and managed in three stages. First part dealt to impart teaching and practical demonstrations at the BSIP from October 3-10, in which eminent scientists of the country and scientists of the Institute delivered following lectures in their respective fields of specialization:

Gondwana Geology, tectonics and terrane accretion—Prof AK Sinha
Early Biosphere and chert microbiota—Prof S Kumar (Lucknow)
Basic aspects of Palaeobotany—Prof CL Verma (Lucknow)
Proterozoic carbonaceous macrofossils—Dr Manoj Shukla
Evolution and radiation of land plants—Prof Manju Banerjee, Kolkata
Recent advances in fossil Pteridophytes—Prof BD Sharma, Narnaul
Ptilophyllum flora—Prof BD Sharma
Glossopteris flora—Dr Shaila Chandra
Dicroidium flora—Dr Jayasri Banerji
Antiquity of Angiosperms—Prof BD Sharma, Narnaul
Role of Charophyta in Geology—Prof SB Bhatia, Chandigarh
Gondwana palynology and coal seam correlation—Dr Archana Tripathi
Comparison of Gondwana flora with contemporaneous flora—Dr AK Srivastava



A practical demonstration organised during the workshop



Participants of the contact course at Jabalpur

A brief account of Tertiary flora (megafossils) of India—Dr JS Guleria
Tertiary Palynology—Dr RK Saxena

RNA and DNA studies in Palaeobotany—Prof D Balasubramanian, Hyderabad

Collision tectonics, uplift and climate change in Himalaya and Tibet—Dr VC Thakur, Dehradun

Application of botanical knowledge in deciphering palaeoclimate—Dr GB Pant, Pune

Coal bed methane—Dr ND Mitra, Kolkata

DOM and biodegradation—Dr BK Misra

Application of coal petrology in exploration and exploitation of coal bed methane—Dr MP Singh, Varanasi

Significance of diatom studies—Dr Anil Chandra

Stratigraphic significance of dinoflagellate cysts—Dr Rahul Garg

Quaternary palynology and its application—Dr Chhaya Sharma

Dinosaurs in India- an overview—Dr Rahul Srivastava, Lucknow

Archaeobotany- an introduction—Dr KS Saraswat

Tree-ring—Dr RR Yadav

Isotopic dating—Dr G Rajagopalan

Electron microscopic study- palaeobotanical techniques—Dr K Ambwani

About BSIP Museum—Dr GP Srivastava

Megaspore from Late Palaeozoic and Mesozoic of India – structural trends and stratigraphic correlation—Dr Rajni Tewari

Fossil Calcareous Algae—Dr AK Ghosh

Trends in Palaeobotany—Dr A Rajanikanth

New trends in Palaeontology—Dr Mukund Sharma

The practical demonstration were conducted to impart training in palaeobotanical techniques—maceration methods, peel and transfer techniques for cuticular study, preparation of ground thin sections, particulate coal pellet preparation, and specialized chemical treatment for the recovery of megaspores, nanofossils, acritarchs, diatoms and phytoplanktons. The method to prepare palaeobotanical samples for SEM

study, geochronological dating, tree-ring analysis and archaeobotanical remains were demonstrated in different laboratories of the Institute by the specialist scientists and technicians. The participants were also given an opportunity to examine the type and figured specimens kept in the museum and herbarium of the Institute.

The second part of the course was related to a one day Field Workshop organized by the Commissioner (Sri M.M. Upadhyay) of Jabalpur Division at Jabalpur (MP) on 12th October. The aim of the workshop was to generate awareness about significance and importance of fossil plants and to preserve the fossiliferous rich sites of MP. During the Workshop, following scientists of the Institute delivered lectures on the themes:

A.K. Srivastava-*Nature and preservation of plant fossils*

J.S. Guleria-*Deccan Intertrappean flora and its significance*

Rashmi Srivastava-*National Fossil Park, Ghughua: palaeofloristics, palaeoecology and palaeophytology of the region.*

The last phase of course was concerned with an intensive seven days (October 13-19) field training to the selected participants, around Jabalpur and adjoining areas to cover the fossil localities of Lower and Upper Gondwana successions and the Infra- and Intertrappean localities. The participants were explained how to identify the rock sequences and other geological features. They were also provided basic information to use the geological



Director, BSIP attending to field participants

parameter and instruments for examining the orientation of rock beds, measurement of dip and identifying faults and sand folds. The demarcation of fossiliferous horizon, collection of plant fossils, palynological samples, examination of stratigraphical and lithological successions was amply demonstrated.

Fossils representing mainly woods, fruits and leaves. The participants were especially taken to the National Fossil Park, Ghughua (in Dindori District) where they were amazed to see very large number of well preserved petrified plants. Interestingly party discovered a sample containing aggregate of 8– 10 eggs from Lameta Ghat Section situated on the right bank of Narmada River about 15 km south west of Jabalpur. The specimen is comparable with dinosaurian eggs, however the smaller

size of the eggs make it distinct from all the known records and more likely belongs to egg pouch of avian fauna.

The Course was concluded at Jabalpur on 19th October, Prof. A.K. Sinha, Director BSIP assured the support to Madhya Pradesh Government and expressed his desire to work jointly for the protection of fossiliferous sites of central India. The course was a successful venture. Participants appreciated the efforts made by the BSIP and suggested to organize such courses at regular intervals in order to acquaint the young scientists with latest developments in the study of Palaeobotany and allied sciences. The Governing Body of the Institute suggested that the Institute should organize every alternate year a course on Application of Palaeobotany.

Consultancy/Technical

Under consultancy services Radiocarbon Lab dated 55 samples and the Institute earned a sum of Rs. 3,04,000. Consultancy services were rendered to the following institutions:

Oil and Natural Gas Corporation Limited, Dehradun
 Geological Survey of India
 Deccan College, Pune
 National Institute of Oceanography, Goa
 Cochin University, Cochi
 Agharkar Research Institute, Pune
 G.B. Pant Institute of Himalayan Environment Development, Sikkim
 Bose Research Institute, Kolkata
 National Bureau of Soil Survey and Land Use Planning, Nagpur
 Centre for Earth Science Studies, Trivandrum
 Jadavpur University, Kolkata
 Anna University, Chennai
 Different wings of Archaeological Survey of India
 M.S. University of Baroda, Vadodara
 Sambalpur University, Jyoti Vihar
 National Institute of Ocean Technology, Chennai
 Wadia Institute of Himalayan Geology, Dehradun
 Kumaon University, Nainital
 Centre for Study of Man and Environment, Kolkata
 G.B. Pant Institute, Almora

K. Ambwani, Usha Bajpai & V.K. Singh provided consultancy services in Scanning Electron Microscopy to the scientists/scholars of various institutions and universities of India.

M. Shukla & R. Babu extended help to Professor A.D. Ahluwalia and his student Sandeep Walia of Department of Geology, Punjab University for the isolation of microbiota from the sediments of Krol-Tal succession, Lesser Himalaya.

J.S. Guleria studied two fossil samples sent for identification by Dr. S.K. Mahajan, Prof. of Botany, P.G. College Khargaon, Madhya Pradesh and submitted a report on identification of the samples.

Asha Khandelwal provided scientific assistance to two M. Sc. students of Environmental Sciences, Lucknow University for their project reports entitled- i) Qualitative and quantitative evaluation of honey samples from different geographical regions of India and Nepal,

Assistance rendered

and ii) Quality check of Branded Honeys: a palynological approach.

In addition, provided consultancy services to Godrej and Boyce Manufacturing Company Ltd., Mumbai for determining the age and pollen analysis of profile samples of disputed mangrove land spread along Thane creek. Surveyed the Vikhroli mangrove forest area in order to collect pollen profiles and C14 dating samples from Vikhorili and Ghatkopar.

Asha Khandelwal & Anjum Farooqui provided consultancy services to Eversmile Construction Company Private Ltd., Mumbai for qualitative and quantitative assessment of pollen grains and cuticles in five soil samples from Mahul Village.

S.K.M. Tripathi provided scientific and technical assistance to Miss Tahmina Siraj, 4th Semester student, Institute of Environmental Studies, Lucknow University, Lucknow in completing her Project report " Palynology, hydrocarbon generation and crude oil pollution".

Chanchala Srivastava rendered practical training and interpretational assistance to one of the M.Sc students of Lucknow University, for her project work in Environmental Sciences.

Rashmi Srivastava indentified 35 samples of dicotyledonous fossil woods from National Fossil Park, Ghughua and submitted a list of indentified woods to the authorities of Forest Department and Commissioner, Jabalpur Division.

Anjum Farooqui provided scientific assistance to Rajani Verma and Poornima Raizada of Lucknow University for their M.Sc. Sem. II Dissertation (Environmental Sciences) report.

Puneet Bisaria provided assistance to two students of Lucknow University to prepare a project for Functional Hindi.

Units

Publication

Journal—The Palaeobotanist

Volume 49(3) of the Journal is published incorporating research papers on various aspects. Papers for Volume 50(1) have been press-readied and edited in the form of "*Proceedings of International Symposium on Multifaceted Aspects of Tree Ring Analysis*" held at BSIP, Lucknow.

Monograph

A monograph entitled "*Precambrian Stromatolites of India and Russia*" authored by Maria E. Raaben, Anshu K. Sinha and Mukund Sharma is published. This monograph is part of the contribution of Integrated Long Term Programme (ILTP) of Co-operation in Science and Technology between Department of Science and Technology, Government of India and Russian Academy of Sciences, Moscow.

Necessary editorial corrections in the text of a monograph- "*An introduction to Gymnosperms, Cycas*

and *Cycadales*" by D. D. Pant were done in collaboration with Professor B.D. Sharma. Relevant figures were processed for resketching and retouching.

BSIP Newsletter

BSIP Newsletter (June 2001) was published with information on important activities of the Institute including participation in exhibitions, conferences, Hindi Pakhwara (fortnight), new additions to library, research findings, science meet reports and related information along with pertinent photographs.

Annual Report

Bilingual (English/Hindi) Annual Report 2000-2001 was published consisting of Research reports, Conference participations, Awards, Research publications, Foundation/Founder's Day function, Annual Accounts and related matters with relevant graphics and



Dr Manju Sharma, Secretary, Department of Biotechnology, New Delhi, releasing the bilingual Annual Report 2000-2001

photographs. It was released on Founder's day (14th November 2001).

Hand-outs

Biographical sketches and Lecture themes of talks delivered on Foundation Day and Founders Day by the guest speakers- Shri Y.B. Sinha, Director (Exploration), Oil & Natural Gas Corporation Limited, India, Dr (Mrs)Manju Sharma, Secretary to the Govt. of India, Department of Biotechnology, New Delhi, and Shri Ravi Shankar, Director-General, Geological Survey of India are published.

Two vivid and well-designed information Brochures of the Institute and Museum were published and distributed during the 89th Session of Indian Science Congress held at University of Lucknow during January, 2002. The Presidential Address of Earth System Science

Session entitled "*Tectonics and Subduction Mechanism across the India-Asia collision in Ladakh and Karakoram*" is published and distributed during the Congress. The abstracts of the research presentation in the Session are also processed.

Invitation/ Greeting Cards

Invitation cards of the Foundation Day and Founder's Day celebrations were published. Two colourful Greetings - 2002, depicting reconstruction of vegetation around Mandla during Early Tertiary and another showing logo of the Institute were printed.

Sale of Institute Publication

This year the publication of the Institute netted an income of Rs. 121,934/-.

Library

The infrastructure facilities have been updated and library is regularly disseminating its information about new arrivals on the institute web site.

The current holdings of library are as under:

Particulars	Additions during 2001-2002	Total
Books	76	5395
Journals	02	10,832
Reprints	400	36,581
Reference Books	02	319
Hindi Books	-	153
Ph.D. Thesis	02	91
Reports	-	46
Maps & Atlases	-	61
Microfilm/ Fisches	-	294
CD	12	36

Currently the library is receiving 158 journals (80 through subscription and 78 in exchange). There are 163 registered card holders using the library facilities.

Exchange Unit

Journals received on exchange basis	78
Reprints of research papers purchased	24

Reprints sent out in exchange	136
Institutions on exchange list	65
Individuals on exchange list	166

Computer Aided Library

The library has recently purchased a fully integrated multi-user LIBSYS 4 software package with addition of Web OPAC. The computers are connected through LAN having 24 hours Internet connectivity. Library is going to convert its older databases to the latest user-friendly format.

Current Awareness Service

Current Awareness Service (CAS) has completed 2 years in its revised form. Library is continuously sending bimonthly CAS bulletin to different institutions and scientists throughout India who are interested in Palaeobotany, Earth sciences and related fields.

Lamination and Xeroxing

Lamination and xeroxing of old and rare publications are in progress. Xeroxing facility is provided to institute scientists and also to scientists of other organizations.

Facility Availed

The following Institutions/ Organisations availed the Library facilities:

Department of Botany, Lucknow University, Lucknow
 Department of Geology, Lucknow University,
 Lucknow
 National Botanical Research Institute, Lucknow
 Sikkim Manipal University, Sikkim
 Department of Library and Information Science, Lucknow
 University, Lucknow.

Museum

Completed work pertaining to Inventory (Part III) of Type and Figured specimens (Megafossils) of research papers published during 1981-1990. The show-cases of the Museum were properly cleaned and polished. Some exhibits were added and the show-cases were rearranged. Delegates highly appreciated the information contained in our display.

An exhibition about the Institute and its activities was organized at Lucknow University during the 89th Session of Indian Science Congress. The exhibition was set up at two places, one at the exhibition Pandal and the other at Geology Department. Delegates and general public took keen interest in the exhibition. National Science Day (28th February) and National Technology Day (11th May) were observed as an Open House.

Specimens/samples collected from 144 localities in the country by the Institute scientists were registered in the museum as a part of annual field work. Type and Figured specimens of 24 research papers were deposited to the repository of the Museum.

Technical assistance and fossil specimen were provided to Botanical Survey of India to develop industrial galley at Indian Museum, Kolkata. In order to popularise the science of Palaeobotany, sets of fossil plants were sent to five educational centres. Scientists from Germany and Russia also visited the Museum, besides citizens of our country.

Type and Figured specimens/slides/Negatives

The scientists of the Institute deposited specimens / slides / negatives of their research publications as under

Particular	Addition during 2001-2002	Total
Type and figured specimens	37	6,185
Type and Figured slides	197	12,308
Negatives	277	16,324

Specimens/samples were collected by the scientists from 144 localities of the country and deposited as under:

Project No	Specimens	Samples
Project 2	454	-
Project 4	70	293
Project 7	203	114
Project 8	152	4
Project 9	45	-
Project 10	343	689
D.S.T. Project	52	-

Samples received from other organizations:

5 samples from Brig. (Retd.) M.G.S. Bhall, Eversmile Construction Company Ltd., Mumbai.
 4 samples from Dr. P.C. Basu, Monitoring Division, G.S.I., Kolkata.
 30 samples from Sri V.K. Mathur, Sr. Geologist, Palaentology Division, G.S.I., Lucknow.

Specimens gifted within the country to the following centres:

Department of Geology and Geophysics,
 University of Kashmir, Srinagar.
 Khalsa Girls Degree College, Harjinder Nagar, Kanpur.
 Kendriya Vidyalaya Gomti Nagar, Lucknow.
 Department of Botany, Paliwal Post-Graduate College, Shikohabad.
 Botanical Survey of India, Industrial Section, Indian Museum, Kolkata.

Institutional Visitors

Students of Botany Department, Lucknow University, Lucknow.
 Students of Botany Department, Amravati University, Maharashtra.
 P.G. Botany Students, B.N.S.D. College, Kanpur.
 Students of Botany, Vikram University, Ujjain,
 Students of M.L.K.P.G. College Balrampur, U.P.
 Student of I.T. College, Lucknow
 Teachers attending refresher course Academic Staff College, Lucknow University.
 P.G. Students, Department of Geology, V.K.S. University, Ara, Bihar

Herbarium

Added about 1000 plant specimens, 26 wood blocks, 500 polleniferous materials and 503 samples of fruits and seeds in the Herbarium from north Shahdol Forest Division (MP). All these plant materials are processed, identified, registered and incorporated in their respective sections. Preparation of data cards for development of Herbarium database management system (DHDMS) is in progress.

Holdings

Particulars	Additions during 2001-2002	Total
Herbarium		
Plant specimens	1,000	18,821
Leaf specimens	100	670
Laminated mounts of venation pattern	-	50
Xylarium		
Wood blocks	26	4,115
Wood discs	-	65
Wood cores	600	2,070
Wood slides	-	4,146
Palm slides (Stem, leaf, petiole, root)	-	3,195
Sporothek		
Polleniferous materials	500	2,290
Pollen slides	450	12,189
Carpothek		
Fruits/Seeds	503	3,861

Herbarium facilities provided to:

Dr A.K. Singh, Department of Botany, Banaras Hindu University, Varanasi
 Dr K.L. Meena, Haldwani Forest Division, Nainital
 Drs M.P. Singh & A.K. Singh, Department of Botany, U.P. P.G. College, Varanasi
 Mr Ashutosh Kumar, Institute of Agricultural Science, BHU, Varanasi
 Mr Manikandan, Botanical Survey of India, Western Circle, Pune
 Mrs Mamoni Saikia, D.K.D. College, Dirgaon
 Dr Krishna D. Ekta, Vikram University, Ujjain
 Dr (Mrs.) Manisha Halder, Ballyganj Science College, Kolkata
 Mr Satya Kumar Bokadia, Delhi University, Delhi

Institutional Visitors:

Students of Cathedral School and C.M.S. Aliganj, Lucknow
 D.K.D. College, Dirgaon
 Amaravati University, Amaravati
 V.V.M. College, Betul
 Rani Laxmi Bai School, Indira Nagar, Lucknow.
 Teachers attending Refresher Course, Academic Staff College, Lucknow University

Electronic Data Processing

Proxy, mail, DNS and backup servers have been successfully upgraded with new hardware. This year Institute has procured six new Pentium-IV systems with all peripherals like UPS, printer and Cd-writer. At present 35 Pentium computers are connected through LAN which provides 24 hrs internet facility to the scientists through the 64 Kbps leased line internet connection. E-mails accounts for more scientists have been opened through Institute mail server using Institute domain name (bsip.res.in).

Norton anti-virus software for Windows NT server version as well as for 95/98 standalone machines have been purchased and installed on all the Pentium machines

which protects the valuable data from viruses. The RockWorks99 software is also provided to facilitate the graphics presentations of the scientific data.

With the help of the new coloured scanner (HP Scanjet 6300C), scanning and modification of figures, maps, charts, etc. have been done for the scientific publications and presentations with better quality production. Slides for the presentation of lectures in several Seminars, Conferences and Workshops are prepared and multimedia presentations are also performed successfully. The laser printer (HP LaserJet 2200D) is introduced to enhance the printing quality.

During this year the unit has developed following software for the Institute:

Herbarium Repository System- This software is developed in dBase-III. The fields selected as are: species, genus, family, locality and collector. The information can be searched and retrieved in any combination of various fields.

Litholog- This software is developed in Visual Basic to prepare litho-column.

Triangle Diagram- This Software is developed in Visual Basic to prepare triangular plotting.

Pollen Analysis Diagram- This Software is developed in Visual Basic to prepare Pollen Analysis Diagram

Institute's web site www.bsip.res.in. is being developed which will be hosted on Institute's server describing history of the Institute achievements, events, current research work, available services, etc. Payroll/pension, accounts packages, etc. are also modified as per the requirements. The data processing work pertaining to annual account, budget, revised estimates and accounts sections reports was done. Besides, the unit has done the basic maintenance of hardware and software and also provided technical support to the scientists.

Section Cutting Unit

Section Cutting Unit is one of the important units of the Institute where fossil and rock samples are cut and their thin sections are made. During the year about 400 slices and 600 slides of thin sections of fossil material were prepared for detailed investigation as per requirements of the scientists. An automatic polishing

machine with hydraulic vacuum system was added to the unit. The machine was designed and fabricated indigenously. A number of scientists, teachers and students visited the Institute Section Cutting Unit. The visitors were given live demonstrations of Section Cutting of fossil material.

Foundation Day and Founder's Day

On September 10, 2001 the Foundation Day of the Institute was celebrated. On this occasion Shri Y.B. Sinha, Director (Exploration) Oil and Natural Gas Corporation Ltd., India, delivered 'Fifth Jubilee Commemoration Lecture' on the topic "Biostratigraphy and its bearing on hydrocarbon potential of Indian sedimentary basins". Professor Ashok Sahni, FNA, Chairman, Governing Body of the Institute presided over the function. Many guests and scientists outside the Institute attended the function.

On November 14, 2001- the Founder's Day, the Institute's staff and distinguished guests from other organisations offered Pushpanjali on the Samadhi of the Founder Professor Birbal Sahni, FRS. Two memorial lectures were organised on this day.

Dr (Mrs) Manju Sharma, Secretary to the Government of India, Department of Biotechnology, New Delhi delivered the '31st Birbal Sahni Memorial Lecture' on the topic "New Biology towards socio economic progress".

Shri Ravi Shanker, Director General, Geological Survey of India, Kolkata delivered the '47th Sir Albert Charles Seward Memorial Lecture' entitled "Palaeogeographic evolution of India". Dr H.K. Gupta, Secretary, Department of Ocean Development, Government of India and Member, Governing Body of the Institute presided over the function.



Shri Y.B. Sinha delivering the Fifth Jubilee Lecture

National Science Day

On 28th February, National Science Day was celebrated enthusiastically on the theme "Wealth from waste". A poster competition was held at the Institute

for the students, in which the response was very good. About 350 students from 25 schools participated in the event. Open house, film and slide show were arranged.



Young participants in Drawing Competition organised by BSIP

The day was also celebrated jointly with Regional Science Centre, Lucknow, where a number of contests were organised for the students. General public also took keen

interest in the activities. Local media both print and electronic covered the activities.



Winners of Institute's sponsored various competitive programmes organised on the occasion of National Science Day at Regional Science Centre, Lucknow.

Distinguished

Dr S.C. Rai, Hon'ble Mayor of Lucknow City
Professor V.S. Ramamurthy, Secretary, Department of
Science & Technology, New Delhi
Dr (Mrs) T.R. Ramamurthy, New Delhi
Dr Harsh K. Gupta, Secretary, Department of Ocean
Development, New Delhi
Dr (Mrs) Manju Sharma, Secretary, Department of
Biotechnology, New Delhi
Sri Ravi Shanker, Director General, Geological
Survey of India, Kolkata
Sri Y.B. Sinha, Director -Exploration, O.N.G.C.,
Dehradun
Dr P.M. Bhargava, Hyderabad, Andhra Pradesh

Visitors

Dr Lalji Singh, Director, Centre for Cellular and
Molecular Biology, Hyderabad
Professor H.Y. Mohan Ram, Ex-Chairman of BSIP
Governing Body, Delhi
Professor M. Kedves, Szeged University, Szeged,
Hungary
Dr Y.L. Nene, Secunderabad, Andhra Pradesh
Dr H.S. Pareek, Sr. Dy. D.G. (Retd.), Geological Survey
of India, Kolkata
Professor B.N. Upreti, Geology Department, Tribhuan
University, Kathmandu, Nepal
Dr Papp Beata, Hungarian Natural History Museum
B.P., Hungary

Status of Official Language

To promote the usage of Hindi in official work, many concrete steps were taken. The Institute continued to be an active member of City's Official Language Implementation Committee (Nagar Rājbhāshā Kāryānvayan Samiti- NARAKAS), as unit- 6. Four meetings of the Institute's Nagar Rājbhāshā Kāryānvayan Samiti were held during the year. In view of the decision of the committee, Institute has unanimously decided to enhance the use of official language in various Projects/ Sections/ Units and to interact with other scientific laboratories in this regard.

Gazette Notification

The Government of India hereby notified the Institute in Gazette of India Part II Section III Sub Section (ii) that more than 80% officers/ employees have working knowledge in Hindi. This is a significant achievement acquired by the Institute for the first time.

Hindi Inspections

Two central inspection teams, one from Department of Science and Technology and another from Official Language Department, Ministry of Home, New Delhi visited the Institute to assess the work in Hindi. The Institute received appreciation from both the teams for

popularising and conducting various Hindi activities.

For doing commendable work in Hindi, this year two first prizes (Rs. 1000/- each) were awarded to Dr Chhaya Sharma and Dr A.K. Srivastava. Recipients of three-second prizes (Rs. 600/- each) were Dr Samir Sarkar, Dr B.D. Singh and Shri N.N. Joshi. Third prizes (Rs. 300/- each) went to five persons- Shri V.K. Singh, Shri M. Pillai, Shri Avinash K. Srivastava, Shri Shtruhan and Shri Nafees Ahmed. These prizes were distributed on the momentous occasion of Founder's Day-November 14th.

Hindi Terminology

Hindi term has regularly been on display on monthly basis to enhance the working knowledge. For this purpose, with the help of multilingual software, a database is prepared on computer.

Annual report-2000-01 of the Institute and abstracts of the research papers of the volume 50 (1 & 2) of the Institute's Journal- The Palaeobotanist are documented in Hindi. Hindi Section of BSIP Newsletter (June-2001) is also processed. The annual report received a Commendation Certificate from the Chairman NARAKAS during its 47th Half-yearly meeting held at CDRI, Lucknow.

Hindi-Pakhwārā

During September 14-28, 2001, Hindi-Pakhwārā (fortnight) was organised in which staff members participated in different activities in a befitting manner. The activities started on 17th September, with the commencement of an inauguration function chaired by the Director, BSIP. A noted Littérateur and retired IAS, Dr Vinod Chandra Pandey 'Vinod', graced the occasion as Chief guest. He delivered a thought provoking and an erudite lecture on "Rājbhāshā ki dashā aur dishā" (Status and direction of official language). On this occasion, a 'Debate' on the topic "Vishwavidyālayon mein Jyotirvigyān ka pāthyakram ke roop mein auchityā" (Justification of Astrology as a subject in the teaching curriculum of universities) was also organised. Winner participants Smt. Anjali Trivedi, Dr Neerja Jha and Dr Mukund Sharma with Shri K.C. Chandola were awarded first, second and third prizes, respectively.

On 19th September, "Hindi Typing Contest" was held, in which the first, second and third prize winners were Shri Hari Lal, Km. Chitra Chatterjee and Smt. Swapna Mazoomdar respectively. Next day a "Hindi Noting and Précis writing Contest" was organised, in which Shri K.C. Chandola, Shri D.K. Pal and Dr Chanchala Srivastava were the winners of first, second and third prizes. "Hindi Elocution Contest" was organized on 25th September. The winners were Shri K.C.

Chandola (Ist) and Dr Jyotsana Rai (IInd). A "Hindi Essay Contest" on the topic " ātankvād " (terrorism) was held on 26th September. Shri Chandra Pal (Ist), Smt. Anjali Trivedi (IInd) and Dr Chanchala Srivastava (IIIrd) succeeded to be the winners of this contest. On 27th September, a "Hindi Prashnamanch Contest" was organised. Seven teams- Malaigiri, Kāmadgiri, Neelgiri, Udaigiri, Trishool, Aravali and Satpurā participated, each team comprising three persons one each from Scientific, Technical & administrative staff. Satpurā team of Dr A.K. Ghosh, Shri R.L. Mehra & Shri A.K. Srivastava won the first prize. Neelgiri team comprising Dr R.R. Yadav, Shri Sanjai Singh & Shri K.C. Chandola won second prize. Malaigiri team represented by Dr Jyotsana Rai, Shri D.K. Pal & Shri Rameshwar Prasad won the third prize.

The Hindi Pakhwārā was concluded on 28th September. On this day, a function was organised in the Institute, which was presided over by the Director, BSIP. Dr R.L. Singh, Chief Conservator of Forest, U.P Government, a celebrated naturalist was the Chief guest on the occasion. In his knowledgeable address, he presented his original experiences on the subject of "Vanya jeeva prabandhan" (Forest life management) and threw considerable light on the latest researches in Bio-piracy and their impact on the world environment. On the last day of Pakhwārā activities, a "Hindi Terminology



A view of Hindi Pakhwara celebrations

Contest" was also held, in which Shri D.K. Pal secured first position, whereas Shri V.K. Singh stood second.

All the winners of the Hindi Pakhwārā contests awarded prizes and certificates on the Founder's Day.

Miscellaneous

Four Quarterly-Reports and one Annual Report consisting of the information regarding Hindi activities of the Institute were prepared on Microsoft Software and sent to DST, New Delhi and Department of Official Language, Ghaziabad. Two Half-yearly reports were also

compiled and sent to NARAKAS, Lucknow. During the year, Institute participated in two meetings of NARAKAS. *iLEAP* Software has been procured to enhance the usage of Hindi. The sayings of renowned scholars in favour of the use of Hindi, have also been affixed at places in the Institute premises. Various forms and requisition slips, gate passes, medical reimbursement forms, increment certificate etc. have been prepared in Hindi, for administrative and official purposes and a number of Hindi letters were drafted.

Reservations and Concessions

To provide adequate representation to Scheduled Castes and Scheduled Tribes and Other Backward Classes for posts meant for direct recruitment, the General Reservation Orders of the Government of India as applicable to Autonomous Bodies and as amended from time to time have sincerely been followed by the Institute. The Roster for reservation of Scheduled Castes and Scheduled Tribes and Other Backward Classes is maintained by post-based Roster as directives of the

Government of India, Department of Personnel and exempted from the purview of the General Reservation Orders.

The Government of India orders issued from time to time for reservation in respect of blind, deaf and orthopaedically handicapped candidates were made applicable in Group "C" and Group "D" posts of the Institute.

The Staff

Director

Professor Anshu Kumar Sinha

Scientists

(The names are in alphabetical order according to 'surnames')

Emeritus Scientist

Dr Govindraja Rajagopalan (w.e.f. 01.08.01)

Scientist 'F'

Dr (Ms) Jayasri Banerji
Dr Anil Chandra
Dr (Mrs) Shaila Chandra
Dr Kripa S. Saraswat
Dr (Mrs) Chhaya Sharma

Scientist 'E'

Dr Krishna Ambwani
Dr Rahul Garg
Dr Jaswant S. Guleria
Dr Jagannath P. Mandal
Dr Ramesh K. Saxena
Dr Manoj Shukla
Dr Ashwini K. Srivastava
Dr Gajendra P. Srivastava
Dr (Mrs) Archana Tripathi
Dr (Ms) Vijaya

Scientist 'D'

Dr Anil Agarwal
Dr (Mrs) Usha Bajpai
Dr Samir K. Bera
Dr Amalava Bhattacharyya
Dr Brijendra N. Jana
Dr (Mrs) Neerja Jha
Dr (Mrs) Asha Khandelwal
Dr Madhav Kumar
Dr Rakesh C. Mehrotra
Dr Basant K. Misra
Dr Chandra M. Nautiyal
Dr Mahesh Prasad
Dr Annamraju Rajanikanth
Dr Ram Awatar

Dr Mulagalapalli R. Rao
Dr Dinesh C. Saini
Dr Omprakash S. Sarate
Dr Samir Sarkar
Dr Rakesh Saxena
Dr Mukund Sharma
Dr Kamal J. Singh
Dr Rama S. Singh
Dr (Mrs) Chanchala Srivastava
Dr Shyam C. Srivastava
Dr S.K.M. Tripathi
Dr Ram R. Yadav

Scientist 'C'

Dr Rupendra Babu
Dr Anant P. Bhattacharyya
Dr Supria Chakraborty
Dr Mohan S. Chauhan
Dr (Ms) Asha Gupta
Dr Khowaja Ateequzzaman
Dr Bhagwan D. Mandaokar
Dr Kindu L. Meena
Dr (Mrs) Neeru Prakash
Dr (Mrs) Vandana Prasad
Dr (Mrs) Jyotsana Rai
Dr Anupam Sharma
Dr (Mrs) Alpana Singh
Dr Bhagwan D. Singh
Dr (Mrs) Rashmi Srivastava
Dr (Mrs) Rajni Tewari
Dr Gyanendra K. Trivedi
Dr Rajeev Upadhyay

Scientist 'A'

Dr (Mrs) Anjum Farooqui
Dr Amit K. Ghosh
Dr (Mrs) Binita Phartiyal
Dr Anil K. Pokharia

Sponsored Project

Dr Vandana Chowdhuri, Research Associate
Mr Jayendra Singh, Project Assistant
Mr Parminder S. Ranhotra, JRF
Mrs Anjali Trivedi, JRF (till 28.02.2002)

Mr Sandeep Bisaria, Lab Assistant
Dr Ratan Kar, Project Investigator
Miss Debi Dutta, JRF
Mr Jagdish Prasad, Field Assistant
Miss Bhasha Dubey, JRF

Technical Personnel

Publication

Mr R.L. Mehra (Technical Assistant 'E')
Mr Syed R. Ali (Technical Assistant 'D')

Library

Mrs Kavita Kumar (Technical Officer 'A')
Mr V.K. Nigam (Technical Assistant 'E')
Mr S.K. Manna (Technical Assistant 'D')
Mr Dharendra Sharma (Technical Assistant 'D')
Mr S.R. Yadav (Technical Assistant 'C')
Mr Avanish Kumar (Technical Assistant 'B')

Museum

Mr P.K. Bajpai (Technical Officer 'C')
Mrs Sunita Khanna (Technical Officer 'A')
Mr Prem Prakash (Technical Officer 'A')
Mr S.K. Singh (Technical Assistant 'D')
Mr R.K. Tantua (Technical Assistant 'D')
Mr Pawan Kumar (Technical Assistant 'A')

Herbarium

Mr S.M. Vethanayagam (Technical Assistant 'D')
Mr Saurabh Pradhan (Technical Assistant 'A')

Photography

Mr Pradeep Mohan (Technical Officer 'A')
Mr D.S. Bisht (Technical Assistant 'D')

Laboratory Services

Dr B. Sekar (Technical Officer 'D')
Mrs Indra Goel (Technical Officer 'C')
Dr (Mrs) M. Chakraborty (Technical Officer 'B')
Mrs Asha Guleria (Technical Officer 'B')
Dr E.G. Khare (Technical Officer 'B')
Mr T.K. Mandal (Technical Officer 'B')
Mr V.K. Singh (Technical Officer 'B')
Mrs Reeta Banerjee (Technical Officer 'A')

Mr Chandra Pal (Technical Officer 'A')
Mr V.P. Singh (Technical Officer 'A')
Mr Avinesh K. Srivastava (Technical Officer 'A')
Mr R.C. Mishra (Technical Officer 'A')
Mr Keshav Ram (Technical Assistant 'E')
Mr Shreerup Goswami (Technical Assistant 'D')
Mr S. Suresh K. Pillai (Technical Assistant 'D')

Technical Services

Mr P.S. Katiyar (Technical Officer 'B')
Mr Madhukar Arvind (Technical Officer 'A')
Mr A.K. Ghosh (Technical Assistant 'E')
Mr V.S. Panwar (Technical Assistant 'E')
Mr Y.P. Singh (Technical Assistant 'E')
Mr D.K. Pal (Technical Assistant 'D')
Mr Madhavendra Singh (Technical Assistant 'D')
Mr Chandra Bali (Technical Assistant 'C')
Mr C.L. Verma (Technical Assistant 'C')
Mr M.S. Rana (Technical Assistant 'B')
Mr S.C. Singh (Technical Assistant 'B')
Mr Ajay K. Srivastava (Technical Assistant 'B')
Mr Om Prakash Yadav (Technical Assistant 'A')

Administrative Personnel

Registrar

Mr S.C. Bajpai

Accounts Officer

Mr J.C. Singh

PS to Director

Mrs M. Jagath Janani

Section Officers

Mr I.J. Mehra
Mr R.K. Takru
Mr Ramesh Chandra
Mr N.N. Joshi

Maintenance Officer

Mr R.B. Kukreti

Accountant

Mr I.J.S. Bedi

Assistants

Mr R.K. Kapoor
Mrs V. Nirmala
Mr Dhoom Singh
Mrs Ruchita Bose
Mrs Usha Chandra
Mrs P. Thomas

Mr Prem Chandra
Mr K.C. Chandola (Technical)
Mr Haradhan Mohanti
Mr Ram Singh
Mr Kesho Ram
Mr Ram Deen
Mr Ram Kishan

Hindi Translator

Dr Puneet Bisaria

Upper Division Clerks

Mr Hari Lal
Mr Koshy Thomas
Mrs Swapna Mazumdar
Mr K.P. Singh
Mr Gopal Singh
Mr M. Pillai
Mr N. Unnikannan
Mrs Shail S. Rathore
Mrs Renu Srivastava
Mr Mishri Lal
Mr S.S. Panwar

Lower Division Clerks

Mr Rameshwar Prasad
Mr Avinash K. Srivastava
Ms Chitra Chatterjee
Mr Akhil Antal

Drivers

Mr Nafees Ahmed ('II')
Mr D.K. Misra ('II')
Mr V.P. Singh ('I')
Mr M.M. Mishra ('I')
Mr P.K. Misra ('I')

Attendants 'III'

Mr Satruhan
Mr Sunder Lal

Attendants 'II'

Mrs Munni
Mr Sri Ram
Mr Bam Singh
Mr Kedar N. Yadav
Mrs Maya Devi
Mr Kailash Nath
Mr Mohammad Shakil
Mr Mani Lal Pal

Attendants 'I'

Mr Ram Ujagar
Mr Ram Dheeraj
Mr K.K. Bajpai
Mr Dhan B. Kunwar
Mr Hari Kishan
Mr S.C. Mishra
Mr V.S. Gaikwad
Mr Ramesh Kumar
Mr R.K. Awasthi
Mr Inder Kumar
Mr Deepak Kumar
Mrs Ram Kali
Miss Nandani
Mrs Beena

Mali

Mr Rameshwar Prasad Pal ('III')
Mr Mathura Prasad ('I')
Mr Ram Chander ('I')
Mr Ram Kewal ('I')

Appointments and Promotions

Appointments

Dr Anupam Sharma, Scientist 'C' w.e.f. 15.10.2001.
Dr Supria Chakraborty, Scientist 'C' w.e.f. 16.11.2001.
Dr Rajeev Upadhyay, Scientist 'C' w.e.f. 20.03.2002.
Dr (Mrs) Binita Phartiyal, Scientist 'A' w.e.f. 08.10.2001.
Dr Anil Kumar Pokharia, Scientist 'A' w.e.f. 22.03.2002.

Dr Ratan Kar, Project Investigator (under SERC Fast Track Scheme) w.e.f. 28.05.2001

Miss Debi Dutta, JRF (Sponsored Project) w.e.f. 25.09.2001

Miss Bhasha Dubey, JRF (Sponsored Project) w.e.f. 07.02.2002.

Mr Jagdish Prasad, Field Assistant (Sponsored Project) w.e.f. 27.12.2001.

Promotions

Dr Jagannath P. Mandal, Scientist 'E' w.e.f. 01.04.2001.

Dr Brijendra N. Jana, Scientist 'D' w.e.f. 01.04.2001 (subject to further/final orders of the Hon'ble High Court).

Dr Amlava Bhattacharyya, Scientist 'D' w.e.f. 01.04.2001.

Dr Samir K. Bera, Scientist 'D' w.e.f. 01.04.2001.

Dr Madhav Kumar, Scientist 'D' w.e.f. 01.04.2001.

Dr Rakesh C. Mehrotra, Scientist 'D' w.e.f. 01.04.2001.

Dr Mahesh Prasad, Scientist 'D' w.e.f. 01.04.2001.

Dr Annamraju Rajanikanth, Scientist 'D' w.e.f. 01.04.2001.

Dr Dinesh C. Saini, Scientist 'D' w.e.f. 01.04.2001.

Dr Omprakash S. Sarate, Scientist 'D' w.e.f. 01.04.2001.

Dr Mukund Sharma, Scientist 'D' w.e.f. 01.04.2001.

Dr Kamal J. Singh, Scientist 'D' w.e.f. 01.04.2001.

Dr (Mrs) Vandana Prasad, Scientist 'C' w.e.f. 01.04.2001.

Mrs Indra Goel, Technical Officer 'C' w.e.f. 01.04.2001.

Mr Prem Prakash, Technical Officer 'B' w.e.f. 01.04.2001.

Mr Madhukar Arvind, Technical Officer 'A' w.e.f. 01.04.2001.

Mrs Jagath Janani, Private Secretary w.e.f. 01.04.2001.

Mr D.K. Misra, Driver II w.e.f. 13.09.2001.

Retirements

Dr G. Rajagopalan, Scientist 'G' retired on 31.07.2001.

Mr Raja Ram, Attendant III (Special Grade) retired on 31.07.2001

Mr J.C. Singh, Accounts Officer retired on 31.03.2002.



Dr G. Rajagopalan



Mr Raja Ram



Mr. J.C. Singh

Research Papers published

- Agarwal A 2002.** Contributions to the fossil leaf assemblage (Miocene) from Neyveli lignite, Tamil Nadu, India. *Paleontographica B* 261 : 167-206.
- Bajpai U 2001.** Ultrastructure of the leaf cuticle in *Cycas circinalis* Linn. *Palaeobotanist* 49(3) : 515-518.
- Bajpai U 2001.** Comparison of ultrastructure of the cuticle in some extinct and extant taxa of gymnosperms from India. *Plant Cell Biol. Devel.* 14 : 17-24.
- Bajpai U, Kumar M, Shukla M, Anand-Prakash & Srivastava GP 2001.** Nature and composition of pyrite framboids and organic substrate from degraded leaf cuticles of Late Tertiary sediments, Mahuadanr Valley, Palamu, Bihar. *Curr. Sci.* 81(1) : 102-106.
- Bajpai U & Maheshwari HK 2001.** Ultrastructure of the leaf cuticle of *Pachypteris indica* and its comparison with that of *Komlopteris indica*. *Acta Palaeobotanica* 40(2) : 131-137.
- Chauhan MS 2001.** Pollen evidence of Late-Quaternary vegetation and climate changes in northeastern Madhya Pradesh. *Palaeobotanist* 49 : 491-500.
- Chauhan MS & Sharma C 2001.** Late-Holocene vegetation and climate in Dewar Tal area, Inner Lesser Garhwal Himalaya. *Palaeobotanist* 49 : 509-514.
- Farooq BM, Lahiri A, Mathur AK, Sharma C, Rajagopalan G & Srivastava PC 2001.** Nizampatnam Khari, Andhra Pradesh me vigat panch hazar varshon me jalvayu parivartano ke sanket. *Samudrika, GSI* 7-8 (1) : 48-56 (in Hindi).
- Farooqui A & Rai V 2001.** Heavy minerals and coastal vegetation during Late Holocene in Pichavaram, Tamil Nadu, India. *In: Rajamanickam GV (Editor)—A handbook of Placer Mineral Deposits*, New Academic Publishers, New Delhi: 211-218.
- Guleria JS & Srivastava R 2001.** Fossil dicotyledonous woods from the Deccan Intertrappean beds of Kachchh, Gujarat, Western India. *Palaeontographica B* 257: 17-33.
- Guleria JS, Srivastava R & Arya R 2001.** Occurrence of fossil *Mitragyna* in the Early Miocene of Himachal Pradesh, India. *Palaeobotanist* 49 (3): 485-489.
- Gupta A 2001.** Algal/fungal spores from Early Tertiary sediments of Sirmaur District, Himachal Pradesh, India. *Tertiary Res.* 21: 1-33.
- Gupta A 2001.** Studies on Aeropalynology in the Temperate belt of Garwal Himalaya. *J. Indian bot. Soc.* 80:47-51.
- Jafar SA & Tripathi SKM 2001.** Late Triassic palynomorphs from the Andaman-Nicobar Basin, Andaman Sea, India. *Modern Geol.* 24 : 205-219.
- Jha N & Sarate OS 2001.** Palynological analysis of Lower Gondwana coals from Ramagundam area, Godavari Valley coalfields, Andhra Pradesh. *Mintech* 22(4) : 25-31.
- Kar R 2001.** Application of palynology in coal exploration: a case study from Tatapani-Ramkola Coalfield, Madhya Pradesh. *Minetech* 22(4) : 33-41.
- Kar R, Ranhotra PS, Bhattacharyya A & Sekar B 2002.** Vegetation vis-a-vis climate and glacial fluctuations of the Gangotri Glacier since last 2000 years. *Curr. Sci.* 82(3) : 347-351.
- Kedves M, Priskin K, Tripathi SKM & Kumar M 2002.** Variations in LM morphology of partially degraded palm pollen grains from India. *Plant Cell Biol. Devel., Hungary* 14 : 75-84.
- Khandelwal A 2002.** Biodeterioration: an aerobiological approach. *In: Mathur GN, Srivastava RB & Agarwal OP (Editors)—Proc. Nat. Sem. Biodeterior. Materials*, Kanpur : 11-15.
- Khare EG, Prasad M & Awasthi N 2001.** Contribution to the Deccan Intertrappean flora of Nawargaon, Wardha District, Maharashtra, India. *Palaeobotanist* 49 : 443-460.
- Kotlia BS, Nakayama K, Bhalla MS, Phartiyal B, Kosaka T, Joshi M, Sanwal J & Pandey RN 2001.** Lithology and magnetic stratigraphy of the Lower-Middle Siwalik successions between Kathgodam and Ranibagh, Kumaun Himalaya. *J. geol. Soc. India* 58 : 411-423.
- Kumar A, Gopalan K & Rajagopalan G 2001.** Age of the Lower Vindhyan sediments, Central India. *Curr. Sci.* 81(7) : 806-809.
- Kumar M, Mandal J, Dutta SK, Bhuyan D, Das B & Saikia B 2001.** Palynostratigraphy of the subsurface sediments of upper Assam Basin, India. *Geobios* 34(3) : 241-251.
- Kumaran KPN, Limaye RB, Rajsekhar C & Rajagopalan G 2001.** Palynoflora and radiocarbon dates of Holocene deposits of Dhamapur, Sindhudurg District, Maharashtra. *Curr. Sci.* 80(10) : 1331-1336.
- Maithy PK, Kumar S & Babu R 2001.** Biological remains and organo-sedimentary structures from Iron Ore Group (Archaean) of Barbil, Singhbhum Craton.

- Proc. Int. Sem. Precambrian Crust in Eastern and Central India, UNESCO-IUGS-IGCP - 368, Bhubneshwar. Geol. Surv. India Spl. Publ. 57 : 98-105.
- Mehrotra RC, Mandaokar BD, Tiwari RP & Rai V 2001.** *Teredolites clavatus* from the Upper Bhuvan Formation of Aizawl District, Mizoram. *Ichnos* 8 (1) : 63-68.
- Raaben ME, Sinha AK & Sharma M 2001.** Precambrian Stromatolites of India and Russia. BSIP Monograph-3 : 1-125.
- Ram-Awatar 2001.** Permo-Triassic boundary in South Rewa Basin- A palynological overview. *Minetech* 22 (5&6) : 61-71.
- Ranhotra PS, Bhattacharyya A, Kar R & Sekar B 2001.** Vegetational and climatic changes around Gangotri Glacier during Holocene. Proc. Symp. Role Earth Sci. in Integrated Development and related Societal issues. Geol. Surv. India. Spl. Publ. 65(III) : 67-71.
- Rao MR 2001.** Palynostratigraphic zonation of the Tertiary sediments of the Kerala Basin, India. Proc. IX Int. Palynol. Congr., Houston, USA, 1996; Am. Assoc. Stratigr. Palynol. Found. : 277-289.
- Sarate OS 2001.** Petrological investigation on the coals from Durgapur Open Cast Mine, Wardha Valley Coalfield, Maharashtra, India., *Minetech*, Vol. 22 (2) : 25-32.
- Sarate OS 2001.** Biopetrology of coals from Krishnavaram area, Chintalapudi Sub-Basin, Godavari Valley coalfields, Andhra Pradesh. *J. geol. Soc. India* 58 : 449-455.
- Sarate OS 2001.** Biopetrological study of the coals from Belampalli Coalfield, Godavari Basin, Andhra Pradesh, India. *Geol. Surv. India. Spl. Pub. No. 54* : 189-202
- Saxena RK 2001.** Palynological investigation of the Sindhudurg Formation in the type area, Sindhudurg District, Maharashtra, India. *ONGC Bull.* 37(1) : 157-166.
- Sharma C 2001.** Modern pollen rain compared to the vegetation in Himalayas. Proc. IX Intern. Palynol. Cong., Houston, USA : 557-565.
- Sharma C 2001.** Palynostratigraphy of Himalayan lacustrine sediments. Proc. IX Int. Palynol. Congr., Houston, USA : 527-532.
- Sharma C, Bera SK & Upreti DK 2002.** Modern pollen-spore rain in Schirmacher Oasis, East Antarctica. *Curr. Sci.* 82 (1) : 88-91.
- Sharma C & Chauhan MS 2001.** Late Quaternary pollen record of vegetation and climate from Kupup Lake (Sikkim), Eastern Himalaya. *J. palaeontol. Soc. India* 46 : 51-58.
- Sharma C, Chauhan MS & Rajagopalan G 2001.** Vegetation and climate of Garhwal Himalaya during last 4,000 years. *Palaeobotanist* 49 : 501-507.
- Sharma C, Chauhan MS, Sharma S, Sharma M & Singh IB 2001.** Proxy records of Holocene vegetation and climate change from Sanai Tal, Central Ganga Plain, Uttar Pradesh. Proc. Nat. Symp. Role Earth. Sci. Integr. and related societal issues. Geol. Surv. India. Pub. 65(III) : 199-202.
- Singh A 2001.** Probability of a new liptinitic maceral from Indian lignites. Proc. Nat. Sem. Recent Advances Geology of Coal and Lignite basins of India, Kolkata (1997). *Geol. Surv. India. Spec. Publ.* 54 : 183-188.
- Singh A 2002.** Rank assessment of Panandhro lignite deposit, Kutch Basin, Gujarat. *J. geol. Soc. India* 59 : 69-77.
- Singh A & Singh BD 2001.** Petrology of Kanhan coals, Satpura Gondwana Basin (India) vis-à-vis coal bed methane. Proc. Int. Sem. Coal Bed Methane: Prospects and Potentialities, Kolkata : 117-130.
- Singh RS & Rajanikanth A 2001.** Occurrence of *Azolla cretacea* Stanley from Meghalaya, North-East India. *Palaeobotanist* 49 : 533-35.
- Srivastava AK 2002.** Taxonomy, palaeobotany and biodiversity. *Curr. Sci.* 81: 1278-1279.
- Srivastava AK & Tewari R 2001.** Lower Gondwana plant fossils from Barren Measures of Jharia Coalfield, Bihar, India. Proc. Nat. Sem. Recent Advances Geol. Coal and Lignite Basins of India, Calcutta (1997). *Geol. Surv. India. Spl. Publ.* 54 : 127-134.
- Srivastava C 2001.** Seed and fruit remains from Ancient Manjhi, district Saran, Bihar. *Pragdhara* 11 : 143-153.
- Srivastava R 2001.** Angiospermous fossil woods from lignite beds of Warkalli Formation, Kerala Coast, India. Proc. Nat. Sem. Recent Advances in Geology of Coal and Lignite Basins of India. *Geol. Surv. India. Spec. Publ.* 54 : 135-144.
- Srivastava R & Guleria JS 2001.** *Grewinium*, a substitute name for *Grewioxylon* Shallom non Schuster. *Palaeobotanist* 49 (3): 531-532.
- Srivastava SC & Kar R 2001.** Palynological dating of some Permian outcrops from Iria Valley, Tatapani-Ramkola Coalfield, Madhya Pradesh, India. *Geol. Surv. India. Spl. Pub.* 54 : 97-102.

- Tewari R 2000.** *Glossopteris ashwinii* a new name for *Glossopteris schopfii* Maheshwari & Tewari 1992. *Palaeobotanist* 49 : 529-530.
- Tewari R & Agarwal A 2001.** Distinctive stomatal structure from dispersed leaf cuticles of Sindhudurg Formation, Maharashtra, India. *Curr. Sci.* 81(12) : 1638.
- Tripathi A 2001.** Fungal remains from Early Cretaceous Intertrappean beds of Rajmahal Basin, Bihar, India. *Cretaceous Res.* 22 : 565-574.
- Tripathi A & Bhattacharyya D 2001.** Palynological resolution of Upper Permian Sequence in Talcher Coalfield, Orissa, India. *Proc. Nat. Sem. Recent Advances in Geology of Coal and Lignite Basins of India, Calcutta (1997)* *geol. Surv. India. Spl. Pub.* 54 : 56-68.
- Upadhyay R 2001.** Middle Cretaceous carbonate build-ups and volcanic seamount in the Shyok suture, northern Ladakh, India. *Curr. Sci.* 81(6) : 695-699.
- Upadhyay R 2001.** Seismically induced soft-sediment deformational structures around Khalsar in the Shyok valley, northern Ladakh and eastern Karakoram, India. *Curr. Sci.* 81(5) : 600-604.
- Vijaya 2001.** Search for Jurassic in sub-surface Mesozoic sediments, Birbhum District, West Bengal. *Proc. XVI Indian Colloq. Micropalaeontol. Stratigr., Bull. ONGC* 37 : 127-135.
- Vijaya & Prasad GVR 2001.** Age of the Kota Formation, Pranhita-Godavari Valley, India: A palynological approach. *J. palaeontol. Soc. India* 46 : 77-93.
- Vijaya, Tripathi A & Ram-Awatar 2001.** Vertical distribution of spore and pollen Index species in the Permian sequence on peninsular India. *In: Weiss RH (Editor)—Contribution to Geology and Palaeontology of Gondwana in honour of Helmut Wopfner, Germany* : 475-495.
- Yadav RR 2001.** Climatic variations over the western Himalayas deduced from tree-rings. *Proc. Symp. Snow Ice Glaciers. Geol. Surv. Ind., Spl. Publ.* 53 : 157-160.

Abstracts published

- Ambwani K, Sahni A, Kar RK & Debi Dutta 2002.** Oldest occurrence of Diatoms (*Melosira*) from the continental Lameta (Late Cretaceous), India: SEM studies. *XXV Ann. Conf. Electron Microscopy Soc. India, Mumbai* : 83-84.
- Bajpai U & Ambwani K 2002.** Variations in the fruit morphology of the genus *Cyperus*: SEM approach. *XXV Ann. Conf. Electron Microscopy Soc. India, Mumbai* : 223-224.
- Bajpai U & Bajpai SC 2001.** The solar cell array environment and its effect. *National Seminar on Energy and Environment, Agra* : 26
- Bajpai U & Farooqui A 2002.** Biogenic mineral precipitation in peat sediment. *XXV Ann. Conf. Electron Microscopy Soc. India, Mumbai* : 85-87.
- Bera SK 2002.** Palynostratigraphical and chronological studies on lake sediments in Schirmacher oasis, East Antarctica. *Under ILTP of Cooperation in Sci. & Technol. between India and Russia, NCAOR, Goa.*, 25-26.
- Bhattacharyya A & Chaudhary V 2002.** Tree-ring analysis from the eastern Himalayan region-an update. *Int. Conf. Quaternary climate, tectonics and environment of the Himalayas, Nainital* : 70.
- Bhattacharyya A, Ranhotra PS & Kotlia BS 2002.** Vegetation and climatic changes around Lamayuru, Trans Himalaya during 35-40 Ka BP. *Int. Conf. Quaternary climate, tectonics and environment of the Himalayas, Nainital* : 9-10.
- Chauhan OS, Malik MA, Sharma C & Suneethi J 2002.** Holocene records of climate variability from Himalayan lake Mansar, India. *Int. Conf. Quaternary climate, tectonics and environment of the Himalayas, Nainital* : 15.
- Farooqui A 2001.** Trace metal and mangroves in Tamil Nadu coastal region, India- A case study. *6th Int. Conf. Biogeochem. Trace Elements, Ontario, Canada* : 513.
- Farooqui A 2002.** Decline in mangrove cover along the south-east coast of India since Holocene. *2nd Int. Conf. Plants and Environmental Pollution, Lucknow* : 109.
- Ghosh AK 2001.** Diversification of the family Sporolithaceae during Cretaceous-Tertiary Period in India. *IPC7, Phycologia* 40 (Suppl.) : 65.
- Gupta A 2002.** Spores through Geologic Time. *World Conf. Bryol., Lucknow* : 68.
- Jha N 2001.** Palynological dating of coal bearing sediments in Bottapagudem area, Chintalpuudi Sub-Basin, Andhra Pradesh. *XVIII Conv. Indian Assoc. Sedimentol.* Aligarh :
- Khandelwal A 2001.** Sampling and estimate of fungal biodeteriogens of Lucknow, India. *5th Intl. Conf. Biodeterior. Cultural Property, Sydney, Australia* :18.
- Khandelwal A 2002.** Qualitative and quantitative assessment of aerobiopollutants in Chowk. *2nd Int. Conf. Plants and Environmental Pollution, Lucknow* : 103.
- Kotlia BS, Sanwal J, Sharma C, Phartiyal B, Pant CC & Rawat KS 2002.** A 21,500-year climatic record and neotectonic in the Kumaun Himalaya, India. *Int. Conf. Quaternary climate, tectonics and environment of the Himalayas, Nainital*: 22.
- Kumar S, Babu R & Maithy PK 2001.** Archaean carbonate platform deposits: An example from the Singhbhum Craton, Eastern India. *4th Int. Archaean Symp. Perth, Australia* : 249-250.
- Mandaokar BD 2002.** Palynology and paleoecological constraints of Middle Bhuban Formation of Lawngtlai, Mizoram, India. *XVIII Indian Colloq. Micropaleont. Stratigr., Nagpur* :51.
- Mehrotra RC 2001.** Status of plant megafossils during the Early Palaeogene in India. *Int. Conf. Climate and Biota of the Early Paleogene, Powell, USA* : 64.
- Mishra SN, Trivedi GK & Shukla OP 2002.** Impact of environmental factors on the habitat of *Alectra parasitica* var. *chitrakutensis* near Sphaticshila, Chitrakoot, Satna District, Madhya Pradesh, India. *2nd Int. Conf. Plants and Environmental Pollution, Lucknow* : 90.
- Phartiyal B, Sharma C, Kotlia BS, Sanwal J & Trivedi A 2002.** Climatic variations in the Kumaun Himalaya over the past 21 ka BP deduced from multidisciplinary techniques. *J. Asian Earth Sci., Spl. Abstract Issue, 17th HKT Workshop, Gangtok* 20(4) : 11.
- Prasad V & Sarkar S 2002.** Palynology and palynofacies analyses: Some essential clues to assess and identify palaeoenvironment of Subathu Formation, Tal Valley, Garhwal Himalayas, Uttaranchal. *J. Asian Earth Sci.*,

- Spl. Abstract Issue, 17th HKT Workshop, Gangtok 20(4) : 7.*
- Rao MR 2002.** Palynology and palaeoecology of Miocene sediments of Mangalore, Karnataka, India. *XVIII Indian Colloq. Micropaleont. Stratigr.* Nagpur: 83.
- Sarkar S 2002.** Tertiary vegetation and palaeoclimate of north-western Himalayan region, India: Palynofossils evidence. *18th Indian Colloq. Micropaleont. Stratigr.*, Nagpur : 89.
- Sarkar S & Prasad V 2002.** Palaeoenvironmental significance of fossil *Pediastrum* in the Palaeogene rocks of N.W. Himalayas. *89th Indian Sci. Congr.*, Lucknow : 119.
- Sarkar S & Saxena RK 2002.** Palynological investigation of the Siju (Middle Eocene) and Rewak (Late Eocene) formations in West Garo Hills, Meghalaya, India. *18th Indian Colloq. Micropaleont. Stratigr.*, Nagpur : 90.
- Sharma C 2002.** Palaeoclimatic inferences from Quaternary lacustrine sediments from Kumaun Himalaya-A review. *Int. Conf. Quaternary climate, tectonics and environment of the Himalaya*, Nainital : 26.
- Sharma C & Chauhan MS 2002.** Palaeoclimatic inferences from Eastern Himalayan Lacustrine sediment since last glacial maximum- A palynological assay. *J. Asian Earth Sci., Spl. Abstract Issue, 17th HKT Workshop, Gangtok 20(4) : 7-8.*
- Sharma C & Dixit A 2001.** Palaeoclimatic inferences from lacustrine sediments from Mansar Lake, Jammu. *2nd Int. Conf. Plants and Environmental Pollution*, Lucknow : 114.
- Singh IB, Srivastava P, Shukla UK, Singhvi AK, Tobschall HJ, Joachimski M, Ramesh R, Rajagopalan G, Sharma Manish, Sharma S, Mitra D, Singh DS, Sharma C & Agarwal KK 2001.** Late Quaternary events in Ganga plain. *Int. Conf. Quaternary climate, tectonics and environment of the Himalayas*, Nainital : (Late abstract).
- Sinha AK 2001.** Subduction mechanism in the Himalayan-Karakoram Mountain belt. *J. Asian Earth Sci., Specl. Abstract Issue, 16th HKT, Austria 19 : 62-63.*
- Sinha AK 2002.** Himalayan-Karakoram orogen: Certain key issues. *J. Asian Earth Sci., Spl. Abstract Issue, 17th HKT Workshop, Gangtok 20(4) : 44.*
- Sinha AK, Jha N & Upadhyay R 2002.** Additional information on palynological dating of Chhongtash Formation in eastern Karakoram and its palaeogeographical significance. *J. Asian Earth Sci., Spl. Abstract Issue, 17th HKT Workshop, Gangtok 20(4) : 11.*
- Srivastava AK 2002.** Fossil *Bryophytes* from India. *World Conf. Bryology*, Lucknow : 127.
- Srivastava AK & Tewari R 2002.** Permian plant fossil assemblages from North-East Himalaya India. *J. Asian Earth Sci., Spl. Abstract Issue, 17th HKT Workshop, Gangtok 20(4) : 45.*
- Srivastava GP 2001.** Floral diversity of Mahuadanr beds Palamu District, Jharkhand. *Nat. Symp. Plant Diversity & Biotechnol.*, Patna : 1.
- Trivedi GK 2002.** Palynology of the Kopili Formation (Late Eocene) exposed along Kopili River Section near Umrongso, North Cachar Hills District, Assam, India. *2nd Int. Conf. Plants and Environmental Pollution*, Lucknow : 10-11.
- Trivedi GK 2002.** Palynostratigraphic zonation and correlation of the Kopili Formation (Late Eocene) exposed on Shillong-Badarpur Road near Lumshnong, Meghalaya, India. *XVIII Indian Colloq. Micropalaeontol. Stratigr.*, Nagpur : 111.
- Upadhyay R 2002.** Evidence of palaeo-seismicity in the India-Asia collision zone, northern Ladakh, India. *89th Indian Sci. Congr.*, Lucknow: 13.
- Upadhyay R 2002.** Palaeoseismic events in the India-Asia collision zone, northern Ladakh and eastern Karakoram, India. *Int. Conf. Quaternary climate, tectonics and environment of the Himalayas*, Nainital : 185-186.
- Upadhyay R, Rai J & Sinha AK 2002.** Discovery of the Bathonian-Callovian nannoflora from the eastern Karakoram Block. *J. Asian Earth Sci., Spl. Abstract Issue, 17th HKT Workshop, Gangtok 20(4) : 46.*
- Upadhyay R, Ram-Awatar & Sinha AK 2002.** Discovery of the Late Permian and Early Triassic palynofossils from the Cretaceous trench-slope sediments of the Indus Suture Zone, Ladakh Himalaya. *J. Asian Earth Sci., Spl. Abstract Issue, 17th HKT Workshop, Gangtok 20(4) : 46.*
- Verma CL, Maurya ON & Bajpai U 2002.** Leaf surface features studies on *Murraya peniculata* in relation to air pollution. *2nd Int. Conf. Plants and Environmental Pollution*, Lucknow :
- Yadav RR & Singh J 2002.** Tree-ring-based spring temperature pattern over the past four centuries in western, Himalaya. *Int. Conf. Quaternary climate, tectonics and Environment of the Himalayas*, Nainital : 70-71

General Articles/Reports published

- Banerji J 2001.** Conference report- *National Symposium on Recent Advances in Geology and Resource Potential of the Kachchh Basin*, Varanasi. *Palaeobotanist* 49 : 546-54.
- Bera SK 2001.** Report- XX Indian Scientific Expedition to Antarctica (2000-01). *BSIP Newsletter* (June) : 5-6.
- Bisaria P 2002.** Kyā hai mānav genome project (in Hindi). *Awadh Archanā* (Feb.-Apr.), Faizabad 28 : 33-34.
- Farooqui A 2001.** Arsenic in groundwater: World's worst calamity. *Indian Express* (2nd November) : 4.
- Farooqui A 2001.** Conference report- *National Seminar on coastal evolution, processes and products, XVII Annual Convention of Indian Association of Sedimentologists*, Cochin (October 17-20, 2000). *Palaeobotanist* 49 : 544-545.
- Farooqui A 2002.** Impact of global warming and sea level rise on coastal wetlands. *Indian Express* (23rd February) : 4.
- Ghosh AK 2001.** Coral reefs- Nature's best model of biodiversity. *BSIP Newsletter* (June) : 14.
- Khandelwal A 2001.** Paragkaron se bhi hoti hai allergy. *BSIP Newsletter* (June) : 22-23.
- Prasad V 2001.** Conference report - "*Application on Micro and Meo-organisms to environmental problems*", Canada. *BSIP Newsletter* (June) : 6.
- Prasad V 2001.** Laughing gas: A tearful future. *Indian Express* (25th October) : 6.
- Prasad V 2001.** Methane hydrate: Future friend or foe. *Indian Express* (6th December) : 6.
- Prasad V 2002.** Greenhouse lessons from fossils. *Indian Express* (24th January) : 6.
- Prasad V & Sarkar S 2001.** Research finding on cyanobacterial mats from basal horizons of Subathu Formation Tal Valley area, Utranchal. *BSIP Newsletter*, June 2001 : 4.
- Rai J 2002.** Jaisalmer jahan kabhi Samudra lehrata tha. *Gyan-Vigyan* (Hindi edition), Scientific periodical, C.D.R.I., Lucknow.
- Singh A 2002.** Srishti (poem in Hindi). *Curr. Sci.* 82 : 592.
- Srivastava AK & Tewari R 2001.** Plant fossils from North-East Himalaya, IGCP India, Newsletter, Kolkata 21 : 9-10.
- Tewari R 2001.** Conference report- *X Meeting of Palaeobotanists and Palynologists*, (RPP), Sao Paulo, Brazil (2000). *Palaeobotanist* 49 : 543-544.
- Tripathi A 2002.** Garbh shakti (poem in Hindi). *Curr. Sci.* 82 : 592.

Papers accepted for publication

- Agarwal A & Ambwani K**—*Amberiocarpon devgarhensis* gen. et sp. nov. from Amberiwadi, Sindhudurg District, Maharashtra, India. Palaeobotanist.
- Agarwal A, Tewari R & Ambwani K**—Observation on dispersed angiospermous leaf cuticles from Sindhudurg Formation, Ratnagiri District, Maharashtra, India. Phytomorphology.
- Ambwani K, Sahni A, Kar RK & Debi Dutta**—Old-est known non-marine Diatoms (*Aulacoseiva*) from the Deccan Intertrappean beds and Lameta Formation (Upper Cretaceous) of India. Rev. Micropalaeontol.
- Bajpai U**—Bio-deterioration of cuticular membrane: ultrastructural study. DMSRDE, Kanpur.
- Bajpai U**—Megaspores from sandy shales associated with a local coal seam exposed in the vicinity of Hahajor Village, Hura Tract, Rajmahal Basin, India. Plant Cell Biol. Devel., Hungary.
- Bajpai U**—On the glossopterids, with particular reference to the stratigraphical distribution of their fructification. Palaeobotanist.
- Bajpai U, Ambwani K & Saini DC**—SEM studies in the fruit morphology of the genus *Cyperus* (Cyperaceae). Phytomorphology.
- Banerji J**—Mesozoic megafloora of Kachchh Basin and its palaeoecological interpretation. Proc. Nat. Symp. Rec. Adv. Geology and Resource Potential of the Kachchh Basin, Varanasi.
- Banerji J & Jana BN**—Petrified Araucarian remains from Sonajori, Rajmahal Basin, India. Palaeobotanist.
- Bera SK**—Early Holocene pollen data from Mikir Hill, Assam. Palaeobotanist.
- Bera SK & Bisaria P 2002**. Duniya mein anootha hai Antarctica. Vigyan Pragati, New Delhi. (in Hindi).
- Bhattacharyya A, Chaudhary V & Gargen JT**—Analysis of tree ring data of *Abies pindrow* around Dokriani Bamak Glacier, Garhwal Himalayas, in relation to climate and glacial fluctuations during recent past. Palaeobotanist.
- Chauhan MS, Rajagopalan G, Sah MP, Philip G & Viridi NS**—Pollen analytical study of Late Holocene sediments from Trans Yamuna segment of Western Doon Valley of Northwest Himalaya. Palaeobotanist.
- Farooqui A**—Arsenic contamination in Adyar estuary: A case study. Asian J. Microbiol., Biotechnol. Envir. Sci.
- Farooqui A**—Micromorphology and adaptation of leaf epidermal traits in Rhizophoraceae to coastal wetland ecosystem. Palaeobotanist.
- Farooqui A & Bajpai U**—Biogenic arsenophyrite in Holocene peat sediment. Eco.Toxicol. Env. Soc., Academic Sci. Publ., USA.
- Farooqui A & Sekar B**—Holocene sea level/climatic changes evidenced by palynostratigraphical and geochemical studies. J. geol. Soc. India.
- Ghosh AK**—Cenozoic coralline algal assemblage from southwestern Kutch and its importance in palaeoenvironment and palaeobathymetry. Curr. Sci.
- Ghosh AK**—Dasycladacean green algae: Their diversification in India in the geologic past. Prof. Pranjit Sarma Felicitation Vol., Burdwan Univ., Burdwan.
- Guleria JS, Gupta SS & Srivastava R**—Fossil woods from the Upper Tertiary sediments of Jammu region (Jammu & Kashmir), North-west India and their significance. Palaeobotanist.
- Gupta A**—Palaeovegetation and Past Climate of Late Holocene from Temperate zone in Naini Tal District, Kumaun Himalaya. Proc. 10th Int. Palynol. Conf., China.
- Jana BN, Bhattacharyya AP & Chakraborti B**—Permian palynological succession from Mand-Raigarh Coalfield, Chhattisgarh. J. geol. Soc., India.
- Kedves M, Priskin K, Tripathi SKM & Kumar M**—Biopolymer structure of the partially degraded cuticles of *Cycas rumphii*: A preliminary report. Plant Cell Biol. Devel., Hungary.
- Khandelwal A**—Long term monitoring of air-borne pollen and fungal spores and their allergenic significance. Palaeobotanist.
- Khandelwal A**—Sampling and estimate of fungal biodeteriogens of Lucknow, India. Proc. 5th Int. Conf. Biodeterior. Cultural Property, Australia.
- Khandelwal A**—Some biodeteriorating air-borne fungi in and around Lucknow. Palaeobotanist.
- Khowaja-Ateequzzaman & Garg R**—Dinoflagellate cyst evidence on the age of Kulakkalnattam Sandstone Member, Garudamangalam Formation, Cauvery Basin. Palaeobotanist.
- Kotlia BS, Sanwal J, Sharma C, Phartiyal B & Rawat KS**—A 36,000- year climatic record and neotectonics in the Kumaun Himalaya, India. Chinese Sci. Bull.

- Maheshwari HK & Bajpai U**—Phytostratigraphical succession in the Glossopteris flora of India. *Revista Universidade to Guarulhos (Cienc.)*, Sao Paulo, Brazil.
- Mandal J & Rao MR**—Taxonomic revision of tricolpate pollen from Indian Tertiary. *Palaeobotanist*.
- Mandaokar BD**—Age and depositional environment of the Upper Bhuban Formation of Champhai area (Eastern Mizo hills) India: a palynological approach. *Palaeobotanist*.
- Mandaokar BD**—Palynofloral investigation of the Tikak Parbat Formation (Late Oligocene) of Borjan Area, Nagaland, India. *Minetech*.
- Phartiyal B, Kotlia BS & Sanwal J**—Feasibility of mineral/environmental magnetic studies in the Late-Quaternary basins of Kumaun Lesser Himalayas: Pithoragarh palaeolake a case study. *J. geol. Soc. India*.
- Prasad M, Chauhan MS & Sah MP**—Morphotaxonomical study on fossil leaves of *Ficus* from late Holocene sediments of Sirmur District Himachal Pradesh, India and their significance in assessment of past climate. *Phytomorphology*
- Rai J**—An overview of nanofossil records from India. *J. palaeontol. Soc. India*.
- Rai J**—Early Callovian nanofossils from the Jara Dome, Kachchh (=Kutch), western India. *J. geol. Soc. India*.
- Rai J**—Late Miocene endoskeletal dinoflagellates from the Sawai Bay Formation, Neill Island, Andaman Sea, India. *J. Paleontol.*, London.
- Saini DC**—*Chenopodium schraderianum* Roem. & Schult. (Chenopodiaceae): A new record for flora of India. *Proc. nat. Acad. Sci. India*.
- Saini DC**—*Talinum portulacifolium* (Forsk.) Asch. ex Schw.: An useful vegetable and garden plant, hitherto unrecorded from upper Gangetic plain. *J. Econ. Taxon. Bot.*
- Saraswat KS & Pokharia AK**—Harappan Plant Economy at Ancient Balu, Haryana. *Pragdhara*.
- Sarkar S & Corvinus G**—Palaeoecological significance of zygospores of Zygnemataceae in the Siwalik sediments of Nepal. *Prof. P. Sarma Felicitation Vol.*, Burdwan Univ., Burdwan.
- Sarkar S & Prasad V**—*Koshliaspermopsis*, a new fungal genus from the Subathu Formation (Late Ypresian) of Lesser Himalayas, India. *Palaeobotanist*.
- Sarkar S & Prasad V**—*Ocimum* pollen grains from the Subathu Formation (Late Ypresian) of Shimla Hills, Himachal Pradesh, India. *Palaeobotanist*.
- Saxena R**—Biostratigraphy and palaeoecology of Lower Permian sediments of West Bokaro Coalfield, Bihar, India. *J. geol. Soc. India*.
- Sekar B**—Radiocarbon dating and its applications in palaeoenvironmental reconstruction in Indian context. *Palaeobotanist*.
- Sharma C, Srivastava C & Yadav DN**—Holocene history of vegetation and climate of fresh water Punlota (Degana) Lake in Eastern Rajasthan, India. *Palaeobotanist*.
- Sharma C, Trivedi A, & Malik MA**—Modern pollen/spore rain in Surinsar and Mansar Lake, Jammu. *Geophytology*.
- Singh A**—On a striking fluorescing microcomponent from Indian Tertiary lignites. *Int. J. Coal Geol.*
- Srivastava AK & Tewari R**—A new gulate megaspore from Satpura Gondwana Basin. *palaeont. Soc. India*.
- Srivastava AK & Tewari R**—Two new types of megaspore from Permian Gondwana Sequence of India. *Permophiles*.
- Srivastava R & Kagemori N**—Fossil wood of *Dryobalanops* from Pliocene deposits of Indonesia. *Palaeobotanist*.
- Srivastava SC**—An Indian Triassic seed displaying angiospermoid features. *Daber Comm. Vol.*, Germany.
- Srivastava SC**—*Ramanujamstrobis*—a new pollen cone from the Middle Triassic (Nidpur beds) of India. *R. Comm. Vol.*, Hyderabad.
- Tewari R & Rajanikanth A**—Occurrence of Glossopteris flora at Pisdura Nand-Dongargaon Sub-basin. *Palaeobotanist*.
- Tewari R, Kumar M, Anand-Prakash, Shukla M & Srivastava GP**—Dispersed angiosperm cuticles from a lignitic clay bed, Sindhudurg Formation, Maharashtra: an interpretation on taxonomy, biodegradation and environment of deposition. *Palaeobotanist*.
- Tripathi A**—Palynological expression of the Permian-Triassic transition in the Talcher Coalfield, India. *Palaeobotanist*.
- Tripathi SKM, Kumar M, Kedves M & Verga B**—LM, SEM and TEM investigations on partially degraded pollen grains of *Cycas rumphii* from India. *Plant Cell Biol. Devel*, Hungary.
- Trivedi GK**—Role of microflora in environmental monitoring and pollution control. *The Botanica*.
- Upadhyay R**—Earthquake induced soft-sediment deformation in the lower Shyok river valley, northern

Ladakh, India. *J. Asian Earth Sci.*

Upadhyay R—Stratigraphy and tectonics of Ladakh, eastern Karakoram, western Tibet and western Kun Lun. *J. geol. Soc. India.*

Upadhyay R—Tectonostratigraphic set-up of the Shyok Suture Zone and the eastern Karakoram terrane: A correlation with the northern Kohistan and western Tibet. Gynodaya Prakashan, Nainital.

Vijaya & Bhattacharji TK—Palynological evidence for Jurassic strata in the Panagarh area, West Bengal, India. *J. Asian Earth Sci., UK.*

Vijaya & Kumar S—Palynostratigraphy of the Spiti Shale (Oxfordian-Berriasian) of Kumaon Tethys Himalaya, Malla Johar area, India. *Rev. Palaeobot. Palynol.*

Yadav RR & Singh J—Tree-ring-based spring temperature pattern over the past four centuries in western Himalaya. *Quaternary Res.*

AUDIT REPORT
to the Governing Body of the
Birbal Sahni Institute of Palaeobotany,
53 University Road, Lucknow

We have audited the attached Balance Sheet of Birbal Sahni Institute of Palaeobotany, Lucknow, as at 31st March 2002 and also the Income & Expenditure account And Receipt & Payment account for the year ended on that date annexed thereto. These financial statements are the responsibility of the Institute's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with auditing standards generally accepted in India. Those Standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statement. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

Further to our comments in the Annexure "A" attached, we report that:

- (i) We have obtained all the information and explanation, which to the best of our knowledge and belief were necessary for the purpose of our audit;
- (ii) In our opinion, proper books of account as required by law have been kept by the Institute so far as appears from our examination of those books;
- (iii) The Balance Sheet and Income & Expenditure account And Receipt & Payment account dealt with by this report are in Agreement with the books of account;
- (iv) In our opinion and to the best of our information and according to the explanations given to us, the said accounts give the information required, in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India;
 - a) In case of the balance Sheet, of the state of affairs of the Institute as at 31st March, 2002;
 - b) In the case of the Income & Expenditure account, of the surplus/deficit for the year ended on the date, and
 - c) In the case of Receipt & Payment account, of the receipts & payments of the Institute for the year ended on that date.

Date : 26.08.2002
Place : Lucknow

For Singh Agarwal & Associates
Chartered Accountants

Sd/-
Mukesh K. Agarwal
(Partner)

ANNEXURE - 'A'

Birbal Sahni Institute of Palaeobotany, Lucknow

Audit Observations made by the Chartered Accountant on the Final Accounts of the Year 2001-2002 and the Action taken by the Institute thereon

**Audit Observations
ACCOUNTS**

Action taken by the Institute

1. The Institute is getting separate grants for Plan & Non-Plan expenses based on the budgets approved by the DST. During the year under report, the institute has utilised Rs.1,30,74,573.00 & Rs.13,50,643.00 to non plan head, from Plan head & Capital head budget respectively with the approval of its Governing Body. It seems that DST grant is not commensurate with the requirement of the Institute under various plans.

No Comments

2. Unsettled advances (capital head) pending for recovery/adjustment as on 31.03.02 is that of Rs.1,35,90,401.00. Out of this old unsettled advances, under the head "Research apparatus & equipment" and "book & journals" are to be properly taken care of at the Institute level for early adjustment.

In fact the amount of Rs.1,35,90,401/- include the amount of Rs.51,51,744/- to the Staff Members of the Institute for H.B.A., Conveyance, Festival, Computer advance, etc. Out of the above a sum of Rs.57,56,055/- have been advanced to CPWD for Capital Works of Auditorium. It also include Rs.21,68,318/- of Library for procurement of Journals, out of this amount, a sum of Rs.1,95,938/- have been settled and a sum of Rs.19,37,701/- have been advanced during the year 2001-2002.

3. A sum of Rs.1,44,639.00 was advanced to M/s DAVP (New Delhi) on 11.06.1999 for publication of various advertisements in the leading newspapers. Against the advance of above amount a sum of Rs.1,18,213.00 was adjusted during the year under audit vide voucher No.51 dated 22.05.2001. Thus a sum of Rs.26,516.00 is still pending for recovery/adjustment with the aforesaid party. This needs to be settled without further delay.

It has been included in Sr. No.4. Action is being taken to settle the advance.

4. In addition to the above there are number of advances outstanding since long shown in the ledger as unsettled. The party-wise details are given below, but these advances are not appearing in the Final Accounts of the Institute. It was informed to us during the discussion that these advances were made against the revenue expenses and have already been booked under the respective head of expenditure. The system adopted by the Institute is against the normally accepted accounting policies. The details of such advances are as under, which are still remain unsettled:

1. Rs.26,516/- action are being taken to settle the advance of DAVP.
2. Rs.3,500/- of Auriga Infor, Ltd. have been settled.
3. Rs.2,135/- and Rs.4,572/- of United India Insu have already been settled.
4. Rs.1,10,242/- and Rs.6,859/- of Prof Anshu Kumar Sinha have been settled.
5. Matter regarding Rs.17,500/- have already been taken up with the organizers.
6. Rs.400/- have been refunded by Sri IJ Mehra and the advance have been settled.
7. Dr Manoj Shukla have been requested to settle the advance immediately.

Date	Name	Amount	Nature
17.08.90	Nandan Khudyadi	36000.00	Centenary
24.09.91	-do-	2000.00	Centenary
06.11.94	K.L.Bhrara, N.Delhi	1285.00	Chem. & Glass
11.06.99	DAVP N.Delhi	26516.00	Advt.
20.07.99	Auriga Infor Ltd.	3500.00	Misc.
04.10.99	Prof. A.K.Sinha	6859.00	Depu.Abroad
24.03.2000	INSDOC, N. Delhi	3025.00	Publication
04.04.2000	Prof.A.K.Sinha	110242.00	Depu.Abroad
26.09.2000	Jais Enterprises	24417.00	Electrical
29.03.01	United India Insu.	2135.00	Appr. & Equip.
26.03.01	-do-	4572.00	-do-
31.10.01	Mr.IJ.Mehra	400.00	Misc.

28.11.01	Dr.Manoj Shukla	80000.00	Rep. & Ren.
06.03.02	A/c 50151	17500.00	Field Ex.
	Total :	Rs. 318451.00	

5. Previous year figures have been regrouped/rearranged wherever necessary so as to make them comparable with the current year figure. No Comments

LIBRARY

6. No physical verification of the library books was carried out by the management during the year under audit. It was explained to us, that as per Central Government Rules, the library stocks are physically verified after the time-gap of 5 years. Last physical verification was done in April 1997 and the next is due in April 2002. The periodicity of verification should be changed to a practical one. Physical verification of the Library is due during the Current Financial year. The same has been initiated.

PUBLICATIONS

7. On scrutiny of records of the priced publication of the Institute, it has been observed that during last several years, the Institute had brought-out publications on different subjects with an objective to sell-out the same, in the market. The stock position of these priced publications as on 31.03.2002 was Rs.27.62 lacs apart from the reserved stock of Rs.4.73 lacs. Thus the total stock of the publications stood at Rs.32.35 lacs at the close of the year, which seems to be on higher side. A practical assessment has to be made for the quantity to be got printed together with its economics etc so that wastage and blockage of funds can be avoided. We have already reduced the quantity for printing of our Journal The Palaeobotanist from 400 to 300. We are also making efforts for wider publicity of our priced publications by giving advertisement in various science magazines/ souvenirs and hosted in our website as well. A realistic assessment of economics of new priced publications is also being done to reduce the stock of priced publications.

STORES

8. The Fixed assets register and stores register is being maintained properly. Physical verification was to be carried out during the year under audit. As per office memorandum No.BSIP-Estt. Asv/2000/I-262 dated 14.06.2000 nine officials of the Institute were deputed to carry out physical verification of Assets of the Institute. It has been informed to us that the job of physical verification is still continuing and will be completed by Oct.-Nov.2002. Physical verification is still continuing. The efforts are being made to complete it as soon as possible.

9. The Institute, being a non-profit earning organization, no depreciation on fixed assets has been provided. No Comments.

RESERVE FUND AND PENSION FUND

10. Reserve Fund and Pension Fund amounting to Rs.32.84 lacs and Rs.62.88 lacs respectively has not been invested and continues to appear in the books as on 31.03.2002. Rs.62.88 lacs of Pension Fund have already been invested during the current financial year. Efforts are being made to invest Rs.32.84 lacs of Reserve Fund in short deposits.

EMPLOYEES PROVIDENT FUND

11. As against the total reserves of Rs.326.46 lacs against Provident Fund as on 31.03.2002, a sum of Rs.270.37 lacs was invested with Nationalized Banks and other organizations as prescribed under the provisions of the Bye Laws of the Institute. No Comments.

Date : 07.09.2002

Place : Lucknow

For Singh Agarwal & Associates
Chartered Accountants
Sd/-
Mukesh K. Agarwal
(Partner)

Sd/-
R.K. Takru
(Accounts Officer)

Sd/-
S.C. Bajpai
(Registrar)

Sd/-
Anshu Kumar Sinha
(Director)

Birbal Sahni Institute of Palaeobotany, Lucknow
Balance Sheet as at March 31, 2001

Fig. in Rupees

CORPUS/CAPITAL FUND AND LIABILITIES	Schedule	Current Year	Previous Year
Corpus/Capital Fund	1	109234385.00	103429167.00
Reserves and Surplus	2	3283705.00	0.00
Earmarked/Endowment Funds	3	39823898.00	34453803.00
Secured Loans and Borrowings	4	0.00	0.00
Unsecured Loans and Borrowings	5	0.00	0.00
Deferred Credit Liabilities	6	0.00	0.00
Current Liabilities and Provisions	7	157286.00	2704926.00
TOTAL		152499274.00	140587896.00
ASSETS			
Fixed Assets	8	96540492.00	88331230.00
Investments-from Earmarked/ Endowment Funds	9	151000.00	151000.00
Investments-others	10	42217381.00	33563581.00
Current Assets, Loans, Advances, etc.	11	13590401.00	18542085.00
Miscellaneous Expenditure (to the extent not written off or adjusted)		0.00	0.00
TOTAL		152499274.00	140587896.00
Significant Accounting Policies	24		
Contingent Liabilities and Notes On Accounts	25		

CERTIFICATE

Certified that the figures of Assets as shown in the Balance Sheet have been reconciled with the total figure of Assets shown in the relevant Registers of the Institute.

For **Singh Agarwal & Associates**
Chartered Accountants
Sd/-
Mukesh K. Agarwal
(Partner)

Sd/-
R.K. Takru
(Accounts Officer)

Sd/-
S.C. Bajpai
(Registrar)

Sd/-
Anshu Kumar Sinha
(Director)

Birbal Sahni Institute of Palaeobotany, Lucknow
Income and Expenditure Account for the year ending March 31, 2002

Fig. in Rupees

INCOME	Schedule	Current Year	Previous Year
Income from Sales/Services	12	201925.00	251150.00
Grants/subsidies (OB, Deposit A/C and Transfer from Cap. Fund)	13	49850643.00	57015889.00
Fees/Subscriptions	14	0.00	72477.00
Income from Investments (Income on Invest. from Earmarked/Endow. Funds transferred to Funds)	15	0.00	0.00
Income from Royalty, Publication, etc.	16	121934.00	238282.00
Interest Earned	17	121812.00	211354.00
Other Income	18	415733.00	1571271.00
Increase/(decrease) in stock of Finished goods and works-in-progress	19	0.00	0.00
TOTAL(A)		50712047.00	59360423.00
EXPENDITURE			
Establishment Expenses	20	35511803.00	36295886.00
Other Administrative Expenses, etc.	21	12044383.00	7768360.00
Expenditure on Grants, Subsidies, etc.	22	0.00	0.00
Interest	23	0.00	0.00
Depreciation (Net Total at the year-end-corresponding to Schedule 8)		0.00	0.00
TOTAL(B)		47556186.00	44064246.00
Balance being excess of Income over Expenditure (A-B)		3155861.00	15296177.00
Transfer to Special Reserve (sepecify each)		0.00	0.00
Transfer to/from General Reserve		0.00	0.00
BALANCE BEING SURPLUS/DEFICIT CARRIED TO CORPUS/CAPITAL FUND		3155861.00	15296177.00
Significant Accounting Policies	24	0.00	0.00
Contingent Liabilities and Notes On Accounts	25	0.00	0.00
<i>For Singh Agarwal & Associates</i>	Sd/-	Sd/-	Sd/-
<i>Chartered Accountants</i>	R.K. Takru	S.C. Bajpai	Anshu Kumar Sinha
Sd/-	<i>(Accounts Officer)</i>	<i>(Registrar)</i>	<i>(Director)</i>
Mukesh K. Agarwal			
<i>(Partner)</i>			

Birbal Sahni Institute of Palaeobotany

Receipts and Payments Account for the year ending March 31, 2002

Fig. in Rupees

RECEIPT			PAYMENTS		
	Current Year	Previous Year		Current Year	Previous Year
I. Opening Balances			I. Expenses		
a) Cash in hand	179	0	a) Establishment Expenses (Corresponding to Schedule 20)	35511803	36295886
b) Bank Balances			b) Administrative Expenses (Corresponding to Schedule 21)	12044383	7768360
i) In current accounts	-2556419	-17636058			
ii) In deposit accounts	0	0	II. Payments made against funds for various projects		
iii) Endowment deposits	0	0	(Name of the fund or project should be shown along with the particulars of payments made for each project)	0	0
II. Grants Received					
a) From Government of India	52500000	51000000	III. Investments and deposits made		
b) From State Government	0	0	a) Out of Earmarked/Endowment funds	0	0
c) From other sources(details)	0	0	b) Out of Own Funds (Investments-Others)	0	0
(Grant for capital & revenue exp. To be shown separately)	0	0			
d) Deposit Account	0	0	IV. Expenditure on Fixed Assets & Capital Work-in-Progress		
			a) Purchase of Fixed Assets	3197367	6093042
			b) Expenditure on Capital Work-in-Progress	0	0
III. Income on Investment from					
a) Earmarked/Endow. Funds	1860	12465	V. Refund of surplus money/ Loans		
b) Own Funds (Utilized)	0	12650889	a) To the Government of India	0	0
			b) To the State Government	0	0
IV. Interest Received			c) To other providers of funds	0	0
a) On Bank deposits	3672	6212			
b) Loans, Advances, etc.	118140	205142	VI. Finance Charges (Interest)	0	0
V. Other Income (specify)			VII. Other Payments (Specify)		
i) Sale proceeds of Publications	121934	238282	i) Advances to Staff	903500	1823500
ii) Miscellaneous Income	517241	1643748	ii) Earnest Money Refunded	25900	23900
iii) Sale of Services (Consultancy)	201925	251150			
			VIII. Closing Balances		
VI. Amount Borrowed	0	0	a) Cash in hand	88	179
			b) Bank Balances		
VII. Any other receipts (give details)			i) In current accounts	227373	-2556419
i) Recovery of Advances	967382	986217	ii) In deposit accounts	0	0
ii) Earnest Money Deposit	34500	49401	iii) Saving account	0	0
iii) FDR Matured	0	41000	iv) Endowment deposit account	0	0
			v) Excess Expenditure	0	0
TOTAL	51910414	49448448	Total	51910414	49448448

For Singh Agarwal & Associates
Chartered Accountants
Sd/-
Mukesh K. Agarwal
(Partner)

Sd/-
R.K. Takru
(Accounts Officer)

Sd/-
S.C. Bajpai
(Registrar)

Sd/-
Anshu Kumar Sinha
(Director)

We are grateful to the Department of Science and Technology, Government of India, New Delhi, to the Governing Body and the Research Advisory Council of the Institute for continued support and guidance.



**With
Best Compliments**

**Prof. Anshu Kumar Sinha,
Director**

Annual Report
2001-2002

© BIRBAL SAHNI INSTITUTE OF PALAEOBOTANY, LUCKNOW 226 007, (U.P.) INDIA

Compiled by

Research Planning and Coordination Cell

Produced by

Publication Unit

Published by

The Director

Birbal Sahni Institute of Palaeobotany

Lucknow 226 007

INDIA

Phone : 91-522-/324291/323206/
325822/325945

Fax : 91-522-381948/374528

E-mail : director@bsip.res.in
publication@bsip.res.in

Website : <http://www.bsip-india.org>

ISSN No: 0972-2726



Front Cover : *Dinogymnium acuminatum* Evitt *et al.* 1967, Late Maastrichtian marker Dinoflagellate, Langpar Formation, Theriaghat area, Khasi hills, Meghalaya. Scale Bar = 10 microns.

Back Cover : Institute's Building illuminated on the occasion of Golden Jubilee celebrations in 1995.

Printed at : Dream Sketch, 29 Brahm Nagar, Lucknow 226 020 Ph: 368630

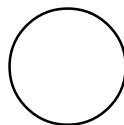
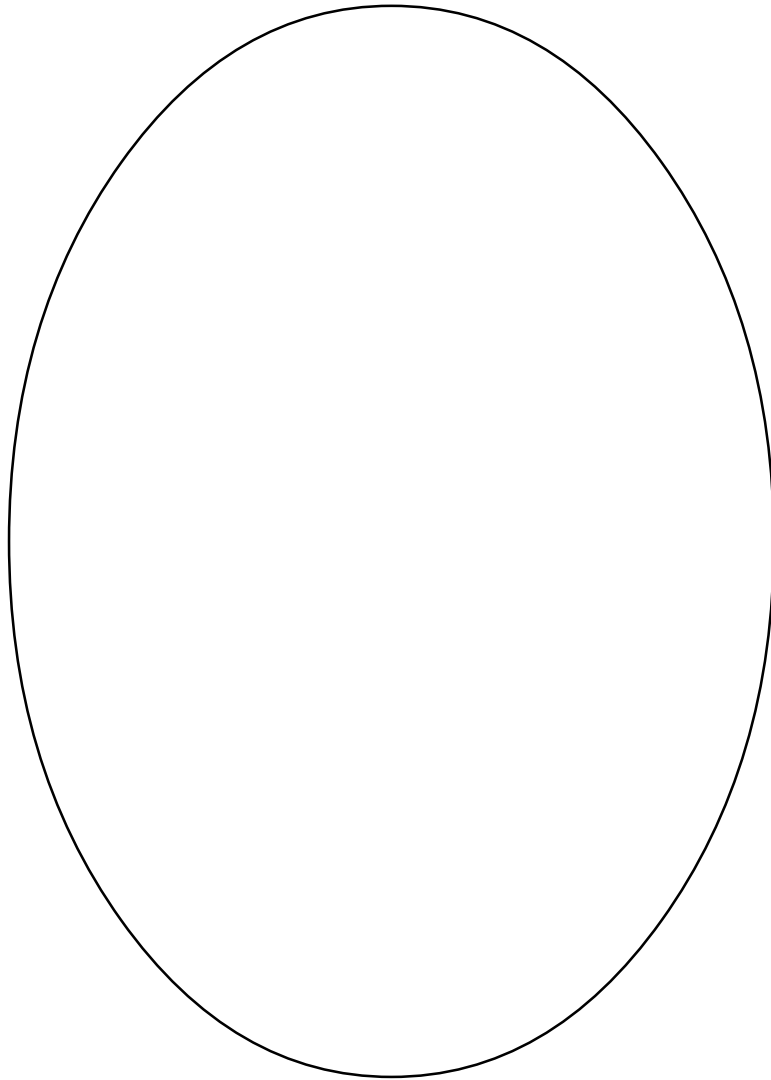
November 2002

Contents

Preface	(i)
Executive Summary	(ii)
Organisational Structure	
Governing Body	1
Research Advisory Council	1
Finance and Building Committee	2
Institute's Organisational set-up	3
Research	
Thrust areas, Projects & Components	4
Contributions other than Project Work	29
Collaborative Work	32
Sponsored Projects	35
Recognition	38
Representation in Committees/Boards	39
Lectures delivered	41
Deputation/Training/Study/Visit abroad/in Country	42
Deputation to Conferences/Symposia/Seminars/Workshops	44
Papers presented at Conferences/Symposia/Meetings	45
Contact Course	47
Consultancy/Technical Assistance rendered	50
Units	
Publication	51
Library	52
Museum	53
Herbarium	54
Electronic Data Processing	54
Section Cutting	55
Foundation Day & Founder's Day	56
National Science Day	57
Distinguished Visitors	58
Status of Official Language	58
Reservations and Concessions	60
The Staff	
Scientists	61
Technical Personnel	62
Administrative Personnel	62
Appointments & Promotions	64
Research Papers published	65
Abstracts published	68
General Articles/Reports published	70
Papers accepted for publication	71
Audit and Accounts-Balance Sheet for the year 2001-2002	74

ANNUAL REPORT

2001-2002



1946

BIRBAL SAHNI INSTITUTE OF PALAEOBOTANY, LUCKNOW

(An Autonomous Institute under Department of Science and Technology, Government of India)

Preface

Birbal Sahni Institute of Palaeobotany is dedicated to promote research on fundamental as well as applied aspects of Palaeobotany. The Institute has taken new initiatives with the adoption of multidisciplinary thrust area programmes in different disciplines of palaeobotany during IX Five Year Plan. During this year the research activities of the institute were carried out to complete the project work of IX Five Year Plan. The targets defined under various projects / components have been by and large achieved. The details of research work carried out in each project are provided in this report.

The research projects and programmes of the Institute have been finalized for X Five Year Plan under following thrust area programmes:

- Precambrian biotic events
- Gondwana floristics, palaeoclimate and palaeoecology: relevance to breakup of Gondwanaland
- Biopetrology of coals and its relevance to coal bed methane
- Palaeobiology of Phanerozoic basins and its bearing on hydrocarbon potential
- Quaternary vegetation, eustatic sea level changes, global climate change and anthropogenic impact

During the period I have received constant support and guidance from Chairman and members of the Governing Body and Research Advisory Council of the Institute to accomplish target oriented tasks. I express my sincere thanks and gratitude to all of them. I would like to thank the members of Research Planning and Coordination Cell—Drs A.K. Srivastava, J.S. Guleria, B.D. Singh; A. Rajanikanth and Mukund Sharma of Publication Unit, technical and administrative staff of the institute for their help and cooperation.

Anshu Kumar Sinha
Director

Executive Summary

The Birbal Sahni Institute of Palaeobotany is an internationally recognized research centre dedicated to promote research on the applied and academic aspects of Palaeobotany. The research activities of the Institute during the final phase of IX Five Year Plan, i.e., 2001-2002 were carried out under 13 projects covering five Thrust Area Programmes, namely: 1. Antiquity of Life. 2. Gondwana Supercontinent: Regional geology, floristics, terrane accretion, plate tectonics and configuration. 3. Biopetrology of Indian coals in relation to coal bed methane. 4. Floristics of petroliferous basins. 5. Quaternary vegetation, climate and monsoon.

During the period 104 research papers/abstracts and 19 reports/articles were published; 63 papers were accepted for publication. Five scientists were deputed to international conferences abroad. Twenty-five scientists were deputed to various National and International conferences held in the country. In addition, almost all scientists and some technical and administrative personnel of the Institute attended the 89th Indian Science Congress held at Lucknow. Thirty-seven research papers were presented in various Conferences/Symposia/Workshops.

Highlights of Important Research Contributions

Presence of acritarchs and cyanobacterial remains have been reported for the first time in the Siltstone Bed of Chandarpur Group, Chhattisgarh. The assemblages suggest coastal, shallow marine conditions and Neoproterozoic age for the Chandarpur Group.

Special emphasis was laid on the palaeobotanical investigation of Extra-Peninsular Gondwana sediments, and micro- and mega- fossils recovered from Permian sediments of North-East Himalayan regions found to be comparable with Barakar and Raniganj floras of Peninsular Gondwana succession.

The miofloral assemblages recorded from bore core samples belonging to a number of coalfields have helped in palynodating the different lithological units.

Mioflora has been recovered for the first time from the Motur beds of Satpura Gondwana Basin showing

affinities with the mioflora of Upper Barakar and Barren Measures assemblages.

New types of megaspore showing gula and characteristic exine ornamentation are recorded from Barakar Formation of Pench Valley Coalfield.

The study of Lower Gondwana plant fossils suggests that the flora of Lower Barakar is comparable with underlying Karharbari flora whereas *Glossopteris* species are characteristic of Upper Barakar flora.

Detailed morpho-anatomical studies of plant fossils from intertrappean cherts of Sonajuri area of Rajmahal Hills have helped in the identification of female cones, root, woods, frond and a possible male cone showing araucarian affinity.

Marker palynotaxa of Early Cretaceous age are recovered from the Dubrajpur Formation of Brahmini Coalfield.

Key issues and new areas of research are identified to understand the collision between the Indian and Asian plates thereby resulting into the major tectonic events during Cenozoic Era. An undated sedimentary sequence of Eastern Karakoram Block has been dated as Early Callovian on the basis of recovery of marker nannofossil taxa.

Petrographic study of coal from Ghorawari area of Pench-Kanhan Coalfield indicates that the coal seams are formed from woody and herbaceous vegetation with frequent spells of oxidative/aerobic conditions. The rank and composition of coal have been found to be within the threshold of coal bed methane generation.

The palynological data, palynofacies analysis, sedimentological study and distribution pattern of OM in the Subathu Formation of Tal Valley, suggest four palynofacies units indicating different sets of environment and depositional model.

Megafossils studied from Siwalik sediments of Uttar Pradesh indicate the presence of evergreen-moist deciduous and mixed deciduous types of vegetation. The Eocene flora of Barmer indicates existence of tropical moist conditions in contrast to dry and desertic conditions prevailing there today. The occurrence of endogenous fungi in the Deccan Intertrappean woods provide

additional evidence of the occurrence of tropical humid climate.

Existence of mangrove vegetation during Early (16,680 yrs BP) and Middle (4280 yrs BP) Holocene was deciphered on the basis of palynological studies of sedimentary profiles of Adyar Estuary, Chennai.

Palynological analysis of a sediment profile from Zub lake, Antarctica below 6 m water column indicates oscillating climate ranging from arid, warm-humid and warm and more humid since 8,000 yrs BP.

The records of rice alongwith barley, wheat, lentil, field pea, etc., from archaeological sites of Ganga Valley region have provided evidences about the direct or indirect cultural contacts of people of Ganga Valley with archaeologically different Harappan area in the North-West.

The tree ring analyses of *Abies spectabilis* suggest that twentieth century warming in the Himalayan region in the past four centuries was within the range of natural variability.

The archaeological samples of the Cambay Basin sent by National Institute of Ocean Technology, Chennai were analysed at Radiocarbon Dating Laboratory of BSIP and an age of 7500 yrs BP was deduced for these samples.

International Collaboration

Under Integrated Long Term Programme (ILTP) between BSIP and Russian Academy of Sciences, a monograph entitled "Precambrian Stromatolites of India and Russia" (by Maria E. Raaben, Anshu Kumar Sinha and Mukund Sharma) was published covering systematic studies of all the type and form genera of Russia and India. Dr. V. Sergeev, Senior Scientist, Geological Institute, Russian Academy of Sciences, Moscow, visited the Institute as ILTP Fellow for 4 months under the Exchange Programme and finalized research papers.

Important Events

Contact Course in Advanced Training in Palaeobotany

Birbal Sahni Institute of Palaeobotany for the first time organized a Contact Course on Advanced Training in Palaeobotany. The Institute received support from ONGC Ltd. and Madhya Pradesh Government in organizing the Field Workshop and Field Training programmes at Jabalpur. The teaching and practical programmes were held at the Institute. Participants from various universities and ONGC Ltd. took active interest in the Course. Eminent scientists of the country and senior members of the Institute presented their views and delivered lectures on different aspects of Palaeobotany.



Sectional President, Earth System Sciences, Prof. Anshu Kumar Sinha greeting Prof. V.K. Gaur who delivered K.P. Rode Memorial lecture during 89th Indian Science Congress held at Lucknow.

89th Session of Indian Science Congress

Director BSIP was the President of the Earth System Science Section of 89th Indian Science Congress. He presided over the programmes of the Session organized at the Geology Department, Lucknow University in collaboration with the Institute. On this occasion, an exhibition was organized by the Institute at Geology Department and in the main Exhibition Pandal of the Science Congress.

The Biotechnology Session of the Science Congress was held in the auditorium of BSIP and the Institute provided all the infrastructural facilities.

Almost all the scientists and some technical and administrative staff members of the Institute participated in the Science Congress.

Memorial Lectures

Dr. Y.B. Sinha, Director (Exploration), ONGC Ltd., delivered the Fifth Jubilee Commemoration Lecture on *Biostratigraphy and its bearing on hydrocarbon potential of Indian Sedimentary Basins*.

On Founder's Day, i.e., 14th November, Dr. (Mrs.) Manju Sharma, Secretary, Department of Biotechnology, Government of India delivered the 31st Birbal Sahni

Memorial Lecture on *New Biology towards Socioeconomic Progress*. Shri Ravi Shanker, Director General, Geological Survey of India, delivered the 47th Sir Albert Charles Seward Memorial Lecture entitled *Palaeogeographic Evolution of India*.

Formulation of X Five Year Plan

As per the suggestion of Research Advisory Council, a series of brain storming sessions were organized in the Institute to finalize the project proposal of X Five Year Plan. All project proposals submitted by the scientists were discussed and examined by a Sub-Committee constituted by the RAC. The project proposals were finalized by the RAC after reviewing the aims, objectives and the working plan. The RAC modified the Thrust Area Programmes under the following heads: 1. Precambrian biotic events. 2. Gondwana floristics, palaeoclimate and palaeoecology: relevance to break up of Gondwana land. 3. Biopetrology of coals and its relevance to Coal Bed Methane. 4. Palaeobiology of Phanerozoic Basins and its bearing on hydrocarbon potential. 5. Quaternary vegetation, eustatic sea level changes, global Climatic change and anthropogenic impact.