

MEMORANDUM OF AGREEMENT

The MEMORANDUM OF AGREEMENT is made on this 23rd March day of Two Thousand and Seventeen BY AND BETWEEN Birbal Sahni Institute of Palaeosciences, Department of Science & Technology, Lucknow, hereinafter referred to as the BSIP (which expression unless excluded by or repugnant to the subject shall mean and include its successor-in-office and assigns) of the ONE PART.

AND

Botanical Survey of India, Central Regional Centre, Allahabad (Botanical Survey of India, Ministry of Environment, Forests & Climate Change, A Central Govt. Organization), having its registered office in/at 10, Chatham Lines, Allahabad-211002 (U.P.), hereinafter referred to as the BSI, CRC (which expression shall where the context so admits include its successors and permitted assigns) of the OTHER PART:

This Memorandum of Agreement (MOA) defines the role and responsibility of the participating agencies, and other matters related to the "Studies of fossil and living plants with reference to the impact of climate change on flora of Gangetic Plains and Central India".

NOW THE PARTIES HERETO AGREE AS FOLLOWS

The collaboration shall be initially for 3 years from date of agreement.

The information and know-how generated from the collaboration will be the joint property of BSI and BSIP, Government of India.

The findings of this collaboration shall be published jointly. Further, party or any member of the party shall not use any material related to this collaboration in any way for publication.

Role of BSI, CRC

BSI, CRC Scientists team shall comprise Dr. G.P. Sinha, Scientist E & Head of Office, Dr. Arti Garg, Scientist D and Dr. A.N. Shukla, Scientist B.

BSI, CRC shall provide information on living plant resources through field exploration, survey and plant collection of recent floristic elements for confirmation/identification/authentication of the corresponding fossil extracts of BSIP.

Pollen material shall be provided from fresh collections or herbarium specimens for pollen morphological studies to be conducted at BSIP through Light Microscope (LM), Confocal Laser Scanning Microscope (CLSM) and Field Emission Scanning Electron Microscope (FESEM), by BSIP. Based on these studies pollen morphological descriptions of living pollen shall be documented by BSI Scientist and then correlation with fossil pollen shall be drawn by the team members of BSI and BSIP together.

Plant samples from fresh collections and herbarium specimens shall be provided for Isotopic analysis (particularly carbon) and other related studies by BSI.

Plant samples and relevant material for study on stomatal indices shall be provided by BSI in terms of oldest herbarium leaf specimens and recent specimens for comparison, to analyze the impact of increased carbon dioxide level in the atmosphere.

Herbarium and Library of Central Regional Centre, BSI, Allahabad will be accessible to team members of BSIP.

Before studies, all the old and rare specimens should be digitized and database to be prepared.

Role of BSIP, Lucknow

BSIP Scientists team shall comprise Dr. Anjum Farooqui (Scientist E), Dr. Sadhan K Basumatary (Scientist C), Dr. Anjali Trivedi (Scientist C), Dr. Swati Tripathi (Scientist C), Dr. Shailesh Agrawal (Scientist B), Dr. Md. Firoze Quamar (Scientist B).

The pollen morphological examination/documentation of voucher plant specimens available at BSI, Allahabad will be performed through Light Microscope (LM), Confocal Laser Scanning Microscope (CLSM) and Field Emission Scanning Electron Microscope (FESEM).

Isotopic analysis (particularly carbon) of plant specimens available at BSI, Allahabad will be performed using Isotope Ratio Mass Spectrometer (IRMS) coupled with Elemental Analyser (EA) at the institute (BSIP). The generated data at BSIP will also be compared

with available standard global carbon isotope values ($\delta^{13}\text{C}$) that may provide an opportunity to fix the end member $\delta^{13}\text{C}$ values of various types of plants (C_3 , C_4 and CAM) from the Indian subcontinent.

Study on the stomatal indices in older herbarium leaf specimens and its comparison in recent year specimens to analyse the impact of increased carbon dioxide level in the atmosphere.

Fossil(s)/ Fossil extracts and library of BSIP will be accessible to team members of BSI.

Field assistance shall be provided to the BSI personnel's, if required, to identify the fossils at a glance in the field.

Training programme shall be organized for BSI Scientists to widen their knowledge on fossils, study the impact of Pollution on present environment *vis a vis* the past, as well as the techniques for Carbon dating, etc.

MONITORING

The progress of the collaborative work shall be monitored and reviewed jointly by Director Botanical Survey of India, Kolkata and Director, Birbal Sahni Institute of Palaeosciences, Lucknow.

SECRECACY

It is hereby agreed that the participating agencies shall keep information and data collected completely secret provided that the right to transfer the technology, if any, shall rest with the BSI and BSIP only.

ARBITRATION

In the event of any question, dispute or difference whatsoever arising between the parties to this Agreement out of or relating to meaning, scope, operation or effect of this Agreement or the validity of the breach thereof shall be referred to an Arbitrator to be appointed by mutual consent of both the parties herein. If the parties cannot agree on the appointment of the Arbitrator within a period of one month from the notification by one party to the other of existence of such dispute then the Arbitrator shall be nominated by the Secretary, Department of Legal Affairs, Ministry of Law & Justice, Government of India. The provisions of the Arbitration and Conciliation Act, 1996 will be applicable and the award made there under shall be final and binding upon the parties hereto, subject to legal remedies available under the law. Such differences shall be deemed to be a submission to arbitration under the Indian Arbitration and Conciliation Act, 1996, or of any modifications or recruitments thereof.

GOVERNING LAW

This Agreement shall be governed by the Law of India for the time being in force.

IN WITNESS WHEREOF the parties hereto have signed sealed and delivered this Agreement on the day, month and year first above written in presence of.

Witnesses

1. *[Signature]* (Dr. Anil Gang, Scientist B)
2. *[Signature]* (Dr. A. N. Shukla)
3. *[Signature]* (A. K. Verma)
4. *[Signature]* (Dr. Neelam Gautam)

Witnesses

- 1.
- 2.
- 3.
- 4.

Signed by: G.P. Sinha
(Scientist E & Head of Office)

On behalf of Director, Botanical Survey of India, Kolkata

Signed by: Anjum Farooqui
(Scientist E)

On behalf of Director, Birbal Sahni Institute Palaeosciences, Lucknow

GOVERNING LAW

This Agreement shall be governed by the Law of India for the time being in force.

IN WITNESS WHEREOF the parties hereto have signed sealed and delivered this Agreement on the day, month and year first above written in presence of,

Witnesses

1. Dr. A. N. Shukla, Aligarh
2. Dr. A. K. Verma, Varanasi
3. Mr. V. K. Singh, Singh
4. Dr. Nishant Sahu, Jaipur

Witnesses

1. Dr. Laxmi Tripathi, Varanasi
2. Dr. Anjali Tripathi
3. Dr. S. K. Barmahal, Varanasi
4. Firoz Anwar

Signed by: G. P. Sinha
(Scientist F & Head of Office)
On behalf of Director, Botanical Survey of India, Kolkata

Signed by: Anjum Farooqui
(Scientist E)

On behalf of Director, Birbal Sahni Institute Palaeosciences, Lucknow