

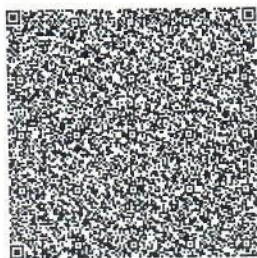


सत्यमेव जयते

INDIA NON JUDICIAL Government of Karnataka

e-Stamp

Certificate No.	: IN-KA53978001679293Q
Certificate Issued Date	: 10-May-2018 10:09 AM
Account Reference	: NONACC (FI)/ kacrsf108/ MANGALORE/ KA-DK
Unique Doc. Reference	: SUBIN-KAKACRSFL0853285863910406Q
Purchased by	: REGISTRAR MANGALORE UNIVERSITY
Description of Document	: Article 12 Bond
Description	: M O U
Consideration Price (Rs.)	: 0 (Zero)
First Party	: DIRECTOR BSIP LUCKNOW
Second Party	: REGISTRAR MANGALORE UNIVERSITY
Stamp Duty Paid By	: REGISTRAR MANGALORE UNIVERSITY
Stamp Duty Amount(Rs.)	: 200 (Two Hundred only)



-----Please write or type below this line-----

MEMORANDUM OF UNDERSTANDING

The MEMORANDUM OF UNDERSTANDING made and entered into this day of 10th May 2018, Tenth May Two Thousand and Eighteen, between Birbal Sahni Institute of Palaeosciences, 53, University Road, Lucknow- 226007 (here in after called **BSIP**), a constituent National Laboratory of the Department of Science and Technology, Government of India.

....2

Statutory Alert:

1. The authenticity of this Stamp Certificate should be verified at "www.shcilestamp.com". Any discrepancy in the details on this Certificate and as available on the website renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

AND

MANGALORE UNIVERSITY, Mangalore (hereinafter called **MANGALORE UNIVERSITY** which expression shall, where the context so admits, include its successors and permitted assigns) of the second part.

PREAMBLE

WHEREAS **MANGALORE UNIVERSITY** is desirous of collaborating with **BSIP** for undertaking exploratory studies for: "Reconstructing the human and animal population history using DNA and Multi- Isotopic analysis of biological samples".

WHEREAS **BSIP** has agreed to collaborate with **MANGALORE UNIVERSITY** for getting the precious human DNA samples and other animal samples, mostly marine creatures to work on DNA and Isotope. (here in after called the PROJECT) as per the scope of the work detailed in Annexure I to this Agreement.

Therefore, in consideration of the premises and mutual covenants hereinafter contained, the parties hereto agree as follows:

SCOPE OF THE MoU

The Agreement details the terms and conditions, financial arrangements, modalities of collaboration, intellectual property rights, responsibilities and obligations of **BSIP** and **MANGALORE UNIVERSITY** pertaining to the PROJECT.

FINANCIAL ARRANGEMENTS

BSIP and **MANGALORE UNIVERSITY** decide to execute joint PROJECT together and apply for the funding agencies to rise their funding. There are no financial commitments are involved from the Mangalore University and BSIP.

MODALITIES OF COLLABORATION

BSIP and **MANGALORE UNIVERSITY** shall work together to achieve the goals of the PROJECT as outlined in the document and conform to the outputs, milestones and targets under Annexure I to this Agreement.

Further, unless otherwise specified, Intellectual Property arising out of this work will be shared equally between the two parties.

There will be a joint Monitoring Group for the PROJECT. The Monitoring Group shall consist of two individuals each from **BSIP** and **MANGALORE UNIVERSITY**. The Monitoring Group will identify the work to be done by **BSIP** and **MANGALORE UNIVERSITY**, the targets / milestones and criteria for completion of the PROJECT; it shall also review periodically the progress of the PROJECT.

RESPONSIBILITIES OF BSIP AND MANGALORE UNIVERSITY

Both the parties shall engage the existing necessary manpower, infrastructure, materials, etc., required for undertaking the PROJECT.

Both the parties shall undertake and complete the work on the PROJECT as per schedule of work separately prepared for each one. The period of completion of work could however be extended to such further periods, as may be mutually agreed to between the parties, without any liability on either party.

Both the parties separately or jointly shall submit a midterm progress report and a detailed final report for each PROJECT.

Neither party shall be responsible for any damage to the property / material of the other party caused by its personnel during or consequent to the work carried out under this Agreement. The scientific investigation of Archaeological samples sometime destructive which may cause some level of morphological damage in the laboratory. Prior to start such kind of risky experiment both the party will take approval.

COMPLETION

The work envisaged to be done by **BSIP / MANGALORE UNIVERSITY** shall be deemed to have been successfully completed by the **BSIP / MANGALORE UNIVERSITY** on submission of the Final Report / fulfillment of its / their responsibilities as detailed in the PROJECT.

The PROJECT shall be deemed to have been successfully completed on satisfaction of criteria fixed by the Monitoring Group or any other criteria mutually agreed by the parties hereto.

RESULTS OF PROJECTS

Any intellectual property rights patents / designs / trademarks / copyrights obtained by the parties hereto pertaining to the PROJECT prior to signing of the Agreement shall remain the property of the respective party.

The intellectual property, viz. know-how / designs / techniques / patents / copyrights generated in the PROJECT shall be jointly owned by **BSIP** and **MANGALORE UNIVERSITY**. The extent of ownership shall be by default equal or otherwise decided mutually depending upon the relative inputs, viz. intellectual / technical / financial / physical made by the parties hereto to the PROJECT.

The procedural formalities for securing and maintaining the intellectual property rights (patents / trademarks / copyrights) if any, shall be the joint responsibility of **BSIP** and **MANGALORE UNIVERSITY**. The expenditure incurred thereof shall be borne by each party in proportion to Intellectual Property ownership. The question of whether or not intellectual property rights should be secured, and the territory where these shall be secured, shall be decided jointly by the parties hereto.

The parties shall consult each other for any publication in respect of the PROJECT. These publications (papers, reports etc.) shall be in the names of contributors from **BSIP** as well as **MANGALORE UNIVERSITY**, wherein it will be duly acknowledged that the work has been carried out under the collaborative program between the parties.

Both **BSIP** and **MANGALORE UNIVERSITY** shall have the rights to use the R&D results generated during the PROJECT for its own R&D programs, without any obligation to the other

CONFIDENTIALITY

During the tenure of the Agreement and for two years thereafter both **BSIP** and **MANGALORE UNIVERSITY** undertake on behalf of their subcontractors / employees / representatives / associates to maintain strict confidentiality and prevent disclosure thereof, of all the information and data exchanged / generated pertaining to work under this Agreement for any purposes other than in accordance with this Agreement.

UTILISATION OF INTELLECTUAL PROPERTY DEVELOPED

BSIP and **MANGALORE UNIVERSITY** shall have the joint rights to license the intellectual property generated in the PROJECT to others and the terms and conditions for licensing to others shall be settled mutually between **BSIP** and **MANGALORE UNIVERSITY**.

MANGALORE UNIVERSITY shall have the right to license the intellectual property generated to others with the approval / concurrence of **BSIP**. The terms and conditions for such licensing shall be settled mutually between **MANGALORE UNIVERSITY** and **BSIP**.

The premia / royalty accrued from licensing of the intellectual property to other parties shall be shared between **BSIP** and **MANGALORE UNIVERSITY** by default equally or otherwise in a ratio to be mutually decided depending upon the relative inputs to the PROJECT and the effort to transfer the intellectual property to other parties.

During the work envisaged under the Agreement, in the event of **BSIP** scientists exploring, inventing or discovering results other than the specific objectives of the PROJECT, **BSIP** shall retain absolute rights on such results.

During the work envisaged under the Agreement, in the event of **MANGALORE UNIVERSITY** professionals exploring, inventing or discovering results other than the specific objectives of the PROJECT, **MANGALORE UNIVERSITY** shall retain absolute rights on such results.

FORCE MAJEURE

Neither party shall be held responsible for non-fulfillment of their respective obligations under this Agreement due to the exigency of one or more of the force majeure events such as but not limited to Acts of God, war, flood, earthquakes, strike, lockouts, epidemics, civil commotion, etc., provided on the occurrence and cessation of any such events, the party affected thereby shall give a notice in writing to the other party within one month of such occurrence or cessation. If the force majeure conditions continue beyond six months, the parties shall then mutually decide the future course of action.

EFFECTIVE DATE, DURATION, TERMINATION OF THE AGREEMENT

The Agreement shall be effective from the date of signing and shall remain in force for a period of five years from the said date.

The Agreement shall terminate on the expiry of the period, unless extended by both the parties

During the tenure of the Agreement, parties hereto can terminate the Agreement either for breach of any of the terms and conditions of this Agreement or otherwise by giving one month's notice in writing to the defaulting party. Failure of either party to terminate the Agreement on account of breach or default by the other shall not constitute a waiver of that party's right to terminate this Agreement.

In the event of termination, the rights and obligations of the parties thereto shall be settled by mutual discussion; the financial settlement shall take into consideration not only the expenditure incurred but also the expenditure committed by the parties hereto.

The Agreement arrived at between the parties hereto for the utilization of the intellectual property, shall survive the termination of the Agreement.

NOTICES

All notices and other communications required to be served on **MANGALORE UNIVERSITY** under the terms of this Agreement, shall be considered to be duly served if the same shall have been delivered to, left with or posted by registered mail to **MANGALORE UNIVERSITY** at its last known address of business. Similarly, any notice to be given to the **BSIP** shall be considered as duly served if the same have been delivered to, left with or posted by registered mail to the **BSIP** at its registered address in Lucknow.

AMENDMENTS TO THE AGREEMENT

No amendment or modification of this Agreement shall be valid unless the same is made in writing by both the parties or their authorized representatives and specifically stating the same to be an amendment of this Agreement. The modifications / changes shall be effective from the date on which they are made / executed, unless otherwise agreed to.

ASSIGNMENT OF THE AGREEMENT

This Agreement or any rights or obligations hereunder shall not be assigned by either party to any third party without the prior written consent of the other party and any attempted assignment without such consent shall be null and void, except that either party may make such assignment, without aforesaid consent, to any entity which survives a merger or consolidation in which such party participates or to any entity which acquires all or substantially all of the assets of such party.

SUCCESSORS:

This agreement shall bind and inure to the benefit of the parties, and their respective successors and permitted assigns.

ARBITRATION

Except as hereinafter provided, any dispute arising out of this Agreement, the same shall be referred to the arbitration of two arbitrators, one to be appointed by each party to the dispute, and case of a difference of opinion between them, to an umpire appointed by the said two arbitrators before entering on the reference, and the decision of such arbitrators or umpire, as the case may be, shall be final and binding on both parties. The venue of arbitration shall be at such place as may be fixed by such arbitrators or umpire and the arbitration proceedings shall take place under the Indian Arbitration & Conciliation Act, 1996 or of any modifications or re-enactments thereof.

GOVERNING LAW

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

SEAL OF PARTIES

In witness whereof the parties hereto have signed this Agreement on the day, month, and year mentioned hereinabove.

Parties

For and on behalf of **BSIP**

For and on behalf of **MANGALORE UNIVERSITY**

Signature R.C. Mehrotra

Signature B. S. Nagendra Prakash

Name: **DR. RAKESH CHANDRA MEHROTRA**

Name: Prof. B.S. Nagendra Prakash

Designation: **Dr. R. C. Mehrotra
Scientist 'G' with Additional
Charge of Director**

Designation: Registrar

Seal **Birbal Sahni Institute of Palaeosciences
(Under Dept. of Science & Technology)
Govt. of India
Lucknow-226007 INDIA**

Seal **Registrar
MANGALORE UNIVERSITY
MANGALAGANGOTTHRI-574 199**

Witness (Name & Address)

Witness (Name & Address)

1. Dr. Niraj Niraj
Scientist, BSIP-Lucknow

1. Dr. M.S. Mustak M.S. Mustak
Associate Professor
Dept. of Applied Zoology, Mangalore University

2. Dr. M.S. Mustak, M.S. Mustak
Associate professor
Dept. of Applied Zoology
Mangalore University

2. Dr. Niraj Niraj
Scientist, BSIP-Lucknow

Date: 10th May 2018

Date: 10th May 2018

Objectives:

1. Earliest human civilization in South Asia has been a mystery over century. Many questions remain unanswered about the identity of the people, how the origin, migration, admixture and settlement of our civilization happened over last ten thousand years ago.
2. The most debatable question is Historic Civilization of South West of India especially, coastal population of Kerala and Karnataka has been a mystery over century. Many questions remain unanswered about the identity of the people, there genetic affinity and relation between other part of India. DNA analysis of several population group from different geographical regions and population groups could reveal the origin, admixture and settlement of this region of South Asia.
3. The large-scale excavation at Karnataka and Kerala (Chalcolithic and Megalithic habitation site) has been a landmark in the history of Indian archaeology. The human and animal skeletal remains of this early farming sites of Karnataka reveals the extensive spread of agriculture and pastoralism which need to be examined scientifically, especially using ancient DNA and stable isotopic method.
4. This study will also help us in understanding of ancient human genome and comparative genomics will provide a lead in identifying the putative disease-causing mutation(s), which have accumulated over a period of time.
5. The outcome of this study would also helpful to understand how our genome has adopted during the last few millennium. This is particularly important to test thrift hypothesis and correlate the lifestyle disease like diabetes, cardiovascular disease, hypertension, etc.
6. We also aim to analyze faunal skeletal remains for e.g. Cattles, Horses, Elephants, Yak and other Vertebrates. Ancient DNA analysis of Horses and Cattle's will provide a great insight in to erliest domestication pattern in Indian Sub- continent.
7. Considering the high throughput implication of Stable Isotopes in Archaeological sciences and having world class facility at BSIP we aim to build up a picture of the dietary context of humans and their domesticated animals (if available) relative to any available wild fauna, focusing on the contribution of high-level trophic foods, the contribution of C₄ crops (such as millet), and reliance on marine or freshwater aquatic protein. These analyses can help to build up a stable isotope ecology of hunter gatherer and early farming communities in the region. This is particularly significant given that social and demographic changes in these periods have been linked to environmental and climatic shifts. Given potential concerns regarding the preservation of bone collagen in South Asia, stable carbon and oxygen isotope analysis of human and faunal tooth enamel will act as a back-up source of information regarding water-stress, water source, and the contribution of C₃ versus C₄ taxa (including millet) to human and animal (if available) diets. Samples of human and faunal tooth enamel will also be taken for strontium isotope analysis. This method has been shown to provide convincing evidence for changing levels of mobility in populations, often linked to migration or changing settlement patterns. As such, this methodology will be able to test theories of mobility of prehistoric populations in South Asia.

8. Faculties and Research Scholars from both the parties will have access to the instrumentations, Services (Radiocarbon Dating), Laboratories, state of the art ancient DNA lab, modern DNA lab, Other sophisticated instruments, Library and other infrastructure facilities at BSIP in order to pursue the joint collaborative research.
9. There will be exchange of Scientists, academic staff, research scholars and students of parties for academic and research purpose.
10. BSIP faculties (Scientist C and above rank) can be involved in teaching and research at MANGALORE UNIVERSITY and can be given visiting scientist or Adjunct faculty status without any financial commitment.
11. Scientist of BSIP (Scientist 'C' above rank) shall be accorded the status of Research Supervisor of MANGALORE UNIVERSITY for the purpose of enrollment and supervision of a student, pursuing research at BSIP, for the award of Ph.D. degree in Zoology and Biotechnology by the MANGALORE UNIVERSITY. In such case a faculty member of MANGALORE UNIVERSITY shall act as Co- Supervisor. In case of a student pursuing for the Ph.D. degree at MANGALORE UNIVERSITY with some part of his research work to be conducted at BSIP, a scientist of BSIP shall act as a Co- supervisor. BSIP. BSIP Research Scholars shall be treated at par with MANGALORE UNIVERSITY Research Scholars for the purpose of registration and fee payment.
12. The Research Scholars shall complete the course work at BSIP or MANGALORE UNIVERSITY and if in Mangalore University- BSIP will be obliged to allow attending the course work classes at MANGALORE UNIVERSITY.
13. Research publications of the joint research projects will be jointly published.

Program of Work/Role of organizations:

Coming up with the state of the art ancient DNA lab in south Asia and world-class facility, BSIP is extremely interested in collaborating with MANGALORE UNIVERSITY, Mangalore. Up on receiving the bone/other samples from MANGALORE UNIVERSITY, DNA will be extracted and subjected to mitochondrial DNA (mtDNA), Y chromosome DNA and whole genome analysis using our sophisticate ancient DNA lab. At the same time 1-2 molars per skeleton (and in the case of paucity, c. 15 mg of enamel powder will be obtained for stable carbon and oxygen isotope analysis using gentle abrasion with a diamond-tipped drill along the full length of the buccal surface or fragment in order to maximize the period of formation represented by the resulting isotopic analysis) will be obtained for analysis. These samples will be analysed for stable carbon, Nitrogen and oxygen isotope analysis as well as (where the entire tooth can be obtained) strontium isotope analysis Further, BSIP will analyze the data and write manuscript(s) with the inputs of investigators from MANGALORE UNIVERSITY, and publish jointly. The required financial expenditure towards analyzing the bone samples would be taken care by the Investigator (Dr. Niraj Rai) of BSIP.