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# Short Term Course cum Workshop on History, Science and Technology of Stone Beads (10-14 August 2015): A Report

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## Introduction

Our country needs well-trained, motivated archaeologists and anthropologists to face diverse future challenges ahead in both fields, which by all predictions are going to be complex and urgent. To realize this, the Archaeological Sciences Centre (ASC), Indian Institute of Technology Gandhinagar (IITGN), has been conducting highly targeted and integrated workshops twice a year. These workshops are aimed primarily at three things: (1) understanding our past with the aid of the most up to date scientific and multi-disciplinary approach, (2) making the best teaching and training program available to students and researchers and (3) generating much needed trained manpower for the future. These workshops have been successful in directly benefiting over a hundred graduate and post graduate students, research scholars and members of department staff of governmental archaeological services by providing them excellent opportunities to develop their research skills and technological competence and get a more meaningful exposure to archaeological science by interacting with leading professionals in the subject. The individuals selected for these workshops have come from different Institutes, Museums and Universities situated across the country, both Government and Private, and are amongst the best as nominated by their Institutes and will act as the ambassadors of our profession in the community at large in times to come.

In the second half of 2015 (August 10<sup>th</sup> to 14<sup>th</sup>), the ASC in collaboration with the Archaeological Survey of India (ASI) conducted a **Short Term Course cum Workshop on History, Science and Technology of Stone Beads** (Fig. 1). It aimed to train manpower in how to study and analyse stone beads in diverse contexts ranging from class rooms, to while being in the field, in laboratories and by working with craftsmen. Stone beads have gained a reputation of being one of the most important markers of prehistoric technological complexity, especially in South Asia and their study is crucial in understanding our past contacts, technology and trade, besides comprehending our

mastery over material culture and the procurement of diverse raw materials. The workshop also showcased Gujarat's cottage industry of stone bead making and the craftsmen (who are the living present of a 5000 year old Indian tradition which dominated certain kinds of bead production) to rest of the world in its true historical, ethnographic, scientific and technological senses.



**Figure 1: Delegates in the auditorium**

This short term course cum workshop discussed the development of stone beads through the ages, ranging from literary and epigraphical references, discussions over the utility and fruitfulness of typologies, the techniques historically used in their production and finally the modern scientific procedures which can be used in their study to better understand and interpret the past technology. The speakers at the course were amongst the best available experts and scholars (seven International and ten Indian) who are all either archaeologists or scientists working in allied disciplines. In addition to these resource persons, traditional bead-making craftsmen from Khambhat were invited to demonstrate their skills during the workshop. All of these resource persons participated in sessions in the form of paper-presentations summarizing analytic and methodological aspects as well as participating in and guiding hands-on experiments. The outcome of this short term course cum workshop is being brought out in the form of a handbook on how to study and analyse stone beads (annexure I).

Eighty participants (young students, scholars, faculty members and archaeological departmental staff members interested in the archaeological and anthropological study of beads, ancient technology and crafts) were selected out of 250 applications received from various universities, research institutes and museums. Many of these institutions hold important stone bead collections of India in particular and South Asia in general. We followed a principle of one staff and one student from one Institute with exception to Archaeological Survey of India and Deccan College Post Graduate & Research Institute.

Experts and participants were from ten countries including USA, UK, France, Japan, Thailand, Iran, Nepal, Sri Lanka, Bangladesh and India. It was gratifying to see that

participants came from most of the Indian states and represented about 30 universities, research institutes, museums, state departments as well as delegates from bead-making industries (annexure II).

This course cum workshop proved to be an experience of a lifetime for the participants. They met eminent personalities of the subject from India and abroad who have excelled in their fields and today are role models to emulate. The participants were exposed to recent research trends, various methods in the scientific analyses of stone beads, and to the traditional craftsmen and their techniques. Participants were also guided through hands on experiments and observed the various process of the bead making as demonstrated by the Khambhat craftsmen both during the workshop and during the fieldtrip to Khambhat. Additionally they got a peep into the ongoing projects in the ASC through the exhibitions of archaeological finds and posters of Archaeological Sciences Centre, and got a feel of Archaeological Science and the holistic approach for interpreting the past.

In an effort to make the workshop holistic and interactive, two more activities parallel to the sessions above and live demonstration of bead making had been organized for the entire period of the five day workshop:

ASC had put results of the research work carried out in last one and half years in the form of 11 posters and that indeed served as the academic delight to the participants and yielded rich dividend to the centre in the form of comments from the experts. The posters included one by visiting Prof. Michel Danino on *Research in Harappan Town-Planning and Metrology*; one by visiting Prof. R.S. Bisht on *Analysis of Weighing System at Dholavira*; two by PDF Scholar Dr. Vinod V: 1. *Harappan Ceramics at Bagasra: A Petrographic Perspective* and 2. *Ceramics from Dholavira: A Typo-Technological Study*; two by PDF scholar Dr. Sandhya Misra: 1. *Archaeobotanical remains from Rupnagar, Punjab* and 2. *Preliminary Results from the Palaebotanical Investigations of Harappan Site of Karanpura in understanding the Climatic Conditions during third millennium BCE in Northern Rajasthan*; three by visiting faculty Dr. V.N. Prabhakar: 1. *Stone Drill bits from Dholavira: A multi-faceted Analysis*, 2. *Excavation of Karanpura district Hanumangarh, Rajasthan and its Scientific investigations* and 3. *Excavations at Rupnagar and its Scientific Investigations*; and two by assistant research Prof. Alok Kumar Kanungo: 1. *The History of the Nagas and the 19<sup>th</sup> Century Museum Oriented German Anthropologists* and 2. *Excavation at Bhagatrav*.

There was an Exhibition on *Finds from Sorath Harappan and Medieval site of Bhagatrav* by Dr. Alok Kumar Kanungo (Fig. 2). This exhibition was the outcome of the first excavation by the ASC at the site in 2014-15 to understand ancient crafts in their context and scientific chronology in comparison to the other contemporary sites in the region as well as long distance contacts. The geological samples, pottery and carnelian debitage retrieved during these excavations and displayed during the workshop generated healthy discussions among the participants and experts.



**Figure 2: Delegates looking at the finds of Bhagatrav**

The short term course cum workshop came to an end with a Valedictory function (Fig. 4) where the Guest of Honour, Dr. S.K. Manjul, Director, Institute of Archaeology, ASI, New Delhi applauded the efforts made by the organizers and visibly justified the collaboration of the ASI. This was followed by the release of the book *Mapping Indo-Pacific Beads vis-à-vis Papanaidupet* by Prof. S.K. Jain (the Book is authored by Alok

Kumar Kanungo, bears a foreword by Prof. S.K. Jain and is published jointly by Aryan Books International, New Delhi and the International Commission on Glass, Spain) (Fig. 3). The dignitaries on the dais (Prof. S.K. Jain, Prof. S.P. Mehrotra, Prof. Girish K. Sharma, Prof. R.S. Bisht and Dr. S.K. Manjul) distributed the certificates to the participants and the vote of thanks was delivered by Dr. Alok Kumar Kanungo.



**Figure 3: Prof. S.K. Jain releasing the book *Mapping Indo-Pacific Beads vis-a-vis Papanaidupet* by Alok Kanungo**



**Figure 4: Participants after the valedictory function**

IITGN acknowledges support received from ASI and Gujarat State Archaeology Department.

## Annexure – I

### 10<sup>th</sup> August 2015

The day begun with the registration of delegates, resource persons, selected and invited participants were provided with their respective identification cards and workshop materials.

The welcome address and the Introduction to the Workshop was delivered by Dr. Alok Kumar Kanungo, IIT Gandhinagar and was followed by ceremonial prayer invocation and lighting of a lamp by the dignitaries on the dais. The welcome address was delivered by Prof. S.P. Mehrotra, Dean R&D, IIT Gandhinagar followed by remarks from Dr. M. Mahadevaiah, Regional Director, ASI, West Zone. The inaugural address was delivered by Prof. S.K. Jain, Director, IIT Gandhinagar (Figs. 5 & 6), and it was followed by the inauguration of a Poster Exhibition (Fig. 7) on the activities of the Archaeological Sciences Centre by Prof. D.V. Pai, Professor in-charge, Humanities & Sciences Disciplines, IIT Gandhinagar.



**Figure 5: Prof. S.K. Jain giving Inaugural Address**

The sessions started with a Plenary Lecture entitled *History of Stone Beads* by Prof. J.M. Kenoyer, University of Wisconsin-Madison, USA, where he gave the broad overview of the origin and development of stone bead technologies in prehistory, stressing the origin of pecking and drilling techniques and developments therein and the crucial significance of identifying these in the study of beads. This was followed by a thought provoking historiography presentation entitled *Small Find, Immense Impact: Importance of Bead Studies* by Prof. Kishore K. Basa, Utkal University, Bhubaneswar. Prof. Basa's lecture reviewed shifts in the study of beads alongside the major artifactual trends and debates on beads in south Asia stressing the need to study distributions and variability as indexes of the semiotic capacities in which beads serve to communicate social distinctions and preferences.



**Figure 6: MOU being executed between ASI and IITGN**



**Figure 7: Delegates looking at the posters**

The theme of the post lunch session was on the challenge of understanding what literary references to beads and bead-making can contribute to this principally archaeological field of study. This session was chaired by Prof. Basa. The first paper, titled *Jewels and Jewellery in the Vedic Literature and their Artifactual Antiquity in the Northwest of Indian Subcontinent* was delivered by Dr. R.S. Bisht, former Jt. Director General, ASI who is presently a visiting professor in IIT Gandhinagar. Dr. Bisht gave an overview of terms and terminology and Vedic references for the stone beads in Rig Veda, Atharva Veda and other later Vedic texts. This was followed by a lecture titled *Stone Beads and Bead Makers in Indian Texts* by Dr. V. Selvakumar, Tamil University, Thanjavur. He gave significant references made in ancient literatures in Tamil such as pathirrupattu, manimekalai etc. which provide representations of a world in which the collection of raw materials and the presence of bead-makers were such features

ordinary of the social landscape so as to be recruited towards sangam era poetic imagery. Dr. Selvakumar also emphasised epigraphic and other records maintained by the patrons and kings who carefully audited the donations of jewels to the Tanjore Brihadheswara temple which has records of donated stone beads including those fashioned from ruby, emerald, lapis lazuli, jasper etc. This was followed by a paper titled *Living Tradition: Stone Bead Production in Khambhat, India: An Ethnoarcheological Approach* by Prof. K. Bhan, MS University of Baroda. He presented the results of a long-term ethno archaeological project mapping the organization, division of tasks and specialized roles and supply and production chains of contemporary bead making in Khambhat. This was followed by the last paper for the day by Prof. Massimo Vidale, University of Padova, Italy titled *Stone Beads: Indus to Iran & Mesopotamia*. Prof. Vidale summarized several recent advances which constrain and complicate the origin of bead technologies in south Asia pointing to evidence of the bead manufacturing complex of the Iranian Chalcolithic in the early 5<sup>th</sup> Millennium BC. He also stressed the need to think about the diversity of raw materials at Mehrgarh and Lapis Lazuli exploitation at Shahr-i-Sokhta and presenting results of new Indus bead finds from near Sumer in Mesopotamia. Together Prof. Vidale asked the participants to be aware of possibly greater time depths to a 'world-system' of trade in semi-precious stones across the Iranian plateau than had hitherto been suspected.

After the end of the session Prof. D.P. Roy, Professor in-charge, General Administration, IIT Gandhinagar inaugurated the Stone Bead Craft Activities. There was live demonstration of each stage of the ancient crafts of stone bead making by the traditional master craftsmen from Khambhat: Mr. Anwar Hussain Shaikh (Fig. 8), Pratap Bhai (Fig. 9), Iqbal Bhai, Shohib Bhai, Salman Bhai and Shadab Bhai. After the conclusion of everyday's sessions and during breaks participants observed demonstrations of reducing cores, making rough outs, grinding and polishing as well as drilling and experimented with these techniques under guidance from these craftsmen.

### **11.08.2015**

The second day began with lectures concentrating on advances in archaeological investigations of bead-technology by deploying modern scientific methods including SEM (Scanning Electron Microscopy), INAA (Instrumental Neutron Activation Analysis), ICP-MS (Inductively Coupled Plasma Mass Spectrometry) and on the social significance of results these methods might generate. The lectures were presented with detailed explanations of the constraints and possibilities afforded by each method and unequivocally, the thrust, of the workshop as whole was on developing exposure, knowledge of and ability to implement and refine such applications of scientific methods towards archaeological ends. This emphasis it should be stressed is directed towards not just the analysis by different methods of archaeological artifacts but also the ethno archaeological components including the vital role of replication studies which in the case of beads in particular are themselves open to further scientific investigations.





**Figure 8: Craftsman Hussain Shaikh demonstrating stone Chipping**

Prof. R.S. Bisht chaired the first two sessions and his comments on each lecture were eye openers. Dr. Bérénice Bellina of the National Centre for Scientific Research, France presented (in absentia) on *Indian stone Ornaments Industries and Maritime Silk Road Cultural Exchanges*. Dr. Bellina's paper synthesized the results of excavations in the last decade at Khao Sam Kheo in the Malay peninsula which have revealed a bead assemblage of considerable raw material diversity, high technical complexity and an artifactual variability which together suggest (as previously also published) a close connection with Indian bead making traditions. Significantly, the evidence, Dr. Bellina suggests, an early first millennium AD context in South East Asia which involved the production of an assemblage fashioned out of techniques which originated in India but which were deployed towards the production of elite markers in styles both common to India and South East Asia but also styles different from the India and particular to the latter region. The next paper, *Ancient Stone Beads of South East Asia and Indian Connection* by Dr. Bunchar Pongpanich, Buddhadasa Indapanno Archives-BIA, Bangkok, Thailand extended this discussion. Without a formal background in archaeology Dr. Bunchar has extensively studied various facets of stone beads in central and western Thailand and in regions near the Cambodian border and stressed the roots of that bead-universe as lying in the Indian subcontinent. He also stressed extensive usage of the similar technologies which helps in historical dating of the South East Asian countries and recent finds of other artifacts of south Asian origin in the region.



**Figure 9: Craftsman Pratap Bhai demonstrating drilling**

The paper *Identification and Pattern of Disintegration of Raw Materials (stones)* by Dr. Vikrant Jain, a geologist at IIT Gandhinagar, brought new dimensions to the course with a review of 'the rock cycle' for archaeologists introducing them to phenomenon such as physical and chemical weathering, as well as the measures of susceptibility to and extent of weathering of different kinds of rock formations and minerals over a long period of time and space. The next paper was presented (in absentia) by Dr. Randall Law, University of Wisconsin-Madison, USA on *Provenience Study* summarized the recent extension of his massive synthesis of raw material sources and their exploitation in the Harappan world to questions of copper and chlorite sources in Oman. Recent research conducted in Oman adds complexity to the already dense world of materials in motion in Harappan times and Dr. Law's systematic analysis and documentation led him to establish that copper ingots found in Oman are in fact identical to those found at Lothal and do not geochemically match the Oman sources. Possibly paired to these transfers of copper were the famous steatite micro-beads many of which were likely produced from steatite mined near Las Bela (Baluchistan).

The post lunch session was chaired by Prof. Ajit Prasad, MS University of Baroda. The first lecture was by Dr. Laure Dussubieux, The Field Museum, Chicago. Her paper *Scientific Analyses of Stone Beads* presented in detail, alongside case-studies, the opportunities, difficulties and necessary precautions which need to be taken when

attempting to use PIXE, INAA or ICP-MS techniques in the analysis of stone beads, particularly in trying to establish their provenience. Prof. J.M. Kenoyer's spoke next on the *Use of SEM in understanding the Stone Bead Technology*. Prof. Kenoyer's lecture was a gift to the students who were present, as they could learn how SEM studies can be used to study bead drilling technologies and their development, variability and change from the very person who has been experimenting and advancing the method in this field for the last 30 years.

### **12.08.2015**

The third day was dedicated towards the assessment of the Harappa stone bead assemblages, the traditional knowledge systems which underlay them, their technological development and regional variability therein and its direct social and economic significance. All of the papers presented synthesis based on years of carefully collected data and all contributed to the engagement with specialized analysis and investigative techniques discussed previously in the workshop.

The pre-lunch sessions were chaired by Prof. Massimo Vidale. The first paper was presented by Prof. J.M. Kenoyer on *Harappan Beads: Typology and Technology*. This paper stressed the principles behind designing a classification system and typology, the essential attributes to record on beads and drills as well as what information should be recorded especially about beads recovered from burials at the time of excavation. Equally the paper presented recent advances in our knowledge about both Harappan bead production technologies as well as their spatial distribution outside the Harappan world which now also includes the site of Troy. This was followed by a detail discussion on *Stone Bead Production through Ages in Gujarat* by Prof. K. Bhan who contextualized the bead production workshop found at Gola Dhara within the a regional sequence which stretches back to Loteshwar and synthesized the available data from several other sites in Gujarat. Complimenting the previous two, the next lecture was on *Early Harappan Bead Production in Gujarat: Technology, Adaptation and Contacts* by Prof. Ajit Prasad. Presenting a detailed consideration of the evidence from Datrana he highlighted the significance of the stockpiling of raw materials and production by both pecking and drilling in the Early Harappan period at the site, a time from which we have few securely dated and well studied bead manufacturing sites from anywhere in the Harappan world. Developing such detailed analysis of site specific data we had another extensive paper on *Documentation and Analysis of Stone Drills: Case Study of Drills from Dholavira* by V.N. Prabhakar, IIT Gandhinagar. He presented an expanded version of his study of drills from Dholavira which represent the largest corpus of Ernestite drills known in the Harappan world. This multi-variate, detailed and methodical documentation of the sizes and dimensions of drills alongside a statistical appraisal of the data so generated were a treat to the participant's knowledge. In addition to the focus on the Harappan world, experts who have collected data at various other sites like Ahichchhatra in Uttar Pradesh, Arikamedu in Pondicherry or had ethnographically investigated current bead use presented their results in this session.

The first paper in the post Lunch session was on *North Indian Early Historic Stone Beads with Special Reference to Ahichhatra* by Dr. Bhuvan Vikrama, ASI, Agra Circle followed by a lecture on *Antiquity of Semi-Precious Stone Beads from Deccan: An Archaeological Ramifications* by Prof. Rabi Mohanty, Deccan College Post-Graduate & Research Institute, Pune. Dr. Vikrama presented results from his recent excavations at the site of Ahichhatra, where a significant new bead assemblage has been documented many of which were possibly produced at that site. Prof. Mohanty spoke about the Deccan plateau traditions and the complexities of the technological sequences and social contexts of bead finds and bead production at the site of Mahurjari and others in the region. The lecture on *South Indian Stones Beads: Archaeological, Textual and Ethnographic Approach to Traditional Gemstone Industry* by Prof. K. Rajan, Pondicherry University, Pondicherry summarized the finds of this extraordinary site where crafts production of various kinds included bead manufacture. This paper generated a fair bit of discussion.

### **13.08.2015**

On the fourth day all the resource persons and the participants had a guided field trip to the famous Harappan port site of Lothal in pre-lunch session and to the medieval port town of Khambhat in the post-lunch session. It was an invaluable experience for the participants to discuss the finds at the Lothal museum and be able to discuss the site itself with the guided talk and discussions in the presence of so many Harappan experts amongst the delegates. Nothing could have been more enriching than touring the bead manufacturing village of Khambhat with three academic giants Profs. Kenoyer, Vidale and Bhan who re-oriented the field of stone bead research through their long term systematic and intensive field work in the 1980s at the same place.

### **14.08.2015**

The preservation and promotion of all the rare, fast vanishing art forms are the concern of not only the academic community, craftsmen and artists but also the wider community. In recent years there have been many attempts towards identifying declining traditions and documenting these before they perish. Alongside the disappearing crafts themselves which may relate to the major or minor traditions, social groups, to the little or higher traditions, are the customs and practices of minorities or majorities. They can relate either directly to the craft or even say to sports but they are vital elements of anthropological research into the status, significance and valence of items such as stone beads. The final day's lectures which were chaired by Prof. Michel Danino responded to such concerns.

The first lecture was delivered by Prof. Manabu Koiso, Kobe Yamate University, Japan on *Stone Bead Users (Symbolic value and Trade): The Nagas*. He spoke about the dying tradition of stone beads and emergence of glass beads, the impact of socio-religious changes on the traditional ways of using stone beads as well as on the industry, and the unifying role demonstrated by the bead wearing conventions of different Naga tribes. This was followed by a lecture on *Contemporary Stone Bead Making in South-East Asia with Special References to Myanmar and Thailand: Imitating the Ancient Finds* by Dr.

Bunchar Pongpanich. The last lecture of the short term course cum workshop on stone beads was on the *Palaeotechnology of Amber Beads in Europe in the Bronze Age* by Prof Massimo Vidale. Prof. Vidale introduced to the audience a raw material type, Amber, which has been extensively studied in Europe but which is rarely considered in south Asia where its presence in the Himalayan belt and use is documented ethnographically.

## Annexure - II

### List of Institutes whose representative(s) participated in the Workshop

From India	
Arunachal Pradesh	Jawaharlal Nehru State Museum
Chattisgarh	Pandit Ravisankar Shukla University
Delhi	Delhi University Institute of Archaeology, Archaeological Survey of India Jawaharlal Nehru University
Gujarat	Archaeological Survey of India, Vadodara Circle Indian Institute of Management Ahmadabad Indian Institute of Technology Gandhinagar Maharaja Sayajirao University of Baroda
Haryana	Ashoka University Kurukshetra University
Karnataka	University of Mysore
Kerala	Kerala Council for Historical Research Marthoma College for Women Union Christian College
Madhya Pradesh	Dr. Hari Singh Gaur University
Maharashtra	Deccan College Deemed University
Nagaland	Anthropological Society of Nagaland Kohima Science College Nagaland Central University
Odisha	Utkal University
Pondicherry	University of Pondicherry
Rajasthan	Department of Archaeology & Museums
Tamil Nadu	Tamil University University of Madras
Telangana	Hyderabad Central University
Uttarakhand	Hemavati Nandan Bahuguna Garhwal University
Uttar Pradesh	Archaeological Survey of India, Agra Circle Banaras Beads Limited Banaras Hindu University
West Bengal	Vishva-Bharati University
	And representatives from NGOs and private individuals

<b>From Abroad</b>	
Bangladesh	Jahangirnagar University
France	National Centre for Scientific Research
Iran	Ethnological Museum, Goletan Palace
Italy	University of Padova
Japan	Kobe Shukugawa Gakuin University
Nepal	Tribhuvan University
Sri Lanka	University of Kelaniya
Thailand	Buddhadasa Archive
United Kingdom	University of Exeter
United State of America	The Field Museum University of Chicago University of Wisconsin-Madison