

Brief report on Workshop on “Archaeometallurgy and Archaeology”
Archaeological Sciences Centre, Indian Institute of Technology
8-9 December, 2014

A two-day workshop on Archaeometallurgy and Archaeology was jointly conducted by Indian Institute of Technology Gandhinagar and Archaeological Survey of India from 8-9 December 2014. The objective of the workshop was to discuss the development of metallurgy through the ages, techniques and investigations involved in archaeometallurgy to interpret the past technology with the help of experts and scholars who are either archaeologists or scientists working in archaeology or allied disciplines.

The inaugural function of the workshop was held at 10.00 AM on 8.12.2014 at the Auditorium, A Block, VGEC Campus. The workshop was formally inaugurated by lighting up the lamp by the dignitaries on the dais, viz., Prof. S. Ranganathan, Prof. Sudhir K. Jain, Prof. S.P. Mehrotra, Dr. S.B. Ota and Prof. S.P. Mehrotra.

The opening welcome remarks were delivered by Prof. S.P. Mehrotra, Dean (R&D) in which he formally welcomed the participants of the workshop and briefly told about the objectives behind starting the Archaeological Sciences Centre. Prof. Michel Danino outlined the objectives and schedule of the workshop. In his inaugural address, Prof. Sudhir K. Jain, Director, IITGN, highlighted the uniqueness in the functioning of IITGN with others, and its role in bridging science and humanity. Dr. S.B. Ota, Regional Director, ASI, highlighted the role of sciences in archaeology and he appreciated the efforts of IITGN to bridge the sciences with humanities. Prof. S. Ranganathan, Emeritus Prof. IISc, Bangalore, in his keynote address entitled, “*Archaeology: Old Subject & New Science*” talked about the role and scope of various science disciplines like mechanical engineering, civil engineering, material science, earth science in an old subject like archaeology. In his talk, he highlighted about the role of interdisciplinary studies in solving several unsolved issues of past whether it is society, culture, technology, climate or evolution.

The technical sessions were spread over two days after the inaugural function. During **Session II**, two lectures were delivered, one each by Prof. Sharada Srinivasan, NIAS, Bengaluru and Ashish Garg, IIT Kanpur. Prof. Sharada Srinivasan introduced the concept of archaeometallurgy and its importance in archaeological studies. Prof. Ashish Garg highlighted the various materials characterization methods that can be used for investigation of archaeological samples. Prof. Garg also emphasized the various facilities available at IIT Kanpur for such investigations including XRD, SEM-EDS, ICP-MS, etc. The lectures were followed by fruitful discussions.

This was followed by **Session III** in which Prof. R.K. Dube, formerly of IIT Kanpur and Prof. Jeevan Kharkwal, Rajasthan Vidyapeeth, Udaipur delivered lectures. Prof. Dube in his lecture on Sanskrit Text, Archaeology and History of Metallurgy highlighted the role of ancient literature in understanding metallurgy, and various processes involved in the manufacture of metals. This was followed by the lecture of Prof. Kharkwal on Zinc Production in Ancient India. Prof.

Kharakwal highlighted on the ancient zinc production as evidenced from the Zawar mines, Rajasthan.

The first day ended with **Session IV** in which Prof. Vibha Tripathi, formerly of BHU discussed about the ethno-archaeological observations on Iron Technology in India. Prof. Tripathi highlighted various aspects of iron working by the natives covering aspects like availability of ore, characterization, and technology associated with iron metallurgy.

The day two started with **Session V**, in which Prof. R.K. Dube and Prof. Kallol Mondal, IIT Kanpur, delivered lectures on *Gold in Ancient India* and *Dal Mardan-the forge-welded iron cannon at Bishnupur* respectively. Prof. Dube presented on various aspects of gold extraction and its reference in ancient literature also. Prof. Mondal presented a case study on the metallurgical aspects of a Dal Mardan, a forge-welded cannon from Bishnupur.

The **Session VI** consisted of two lectures again, one each by Prof. Sharada Srinivasan and Dr. R.S. Bisht. Prof. Sharada dealt with two of her case studies on high tin bronzes and wootz steel. Prof. Sharada also presented a documentary of the high tin bronze mirrors still manufactured in Aranmula, Kerala. Prof. R.S. Bisht highlighted on the relevance of archaeometallurgy from an archaeological perspective. Later in the day, Prof. Sharada continued with her other case study on wootz steel in highlighting the various characteristics of high carbon steel production in ancient India and its metallurgical aspects.

This was followed by a **Panel Discussion** moderated by Prof. S.P. Mehrotra and the participants in the session were Prof. Ranganathan, Dr. S.B. Ota, Prof. R.S. Bisht, Prof. Sandeep Sangal, Prof. R.K. Dube, Prof. S.P. Mehrotra, Prof. Michel Danino, Prof. Ashish Garg, Prof. Kallol Mondal, Prof. J.S. Kharakwal, Prof. Vibha Tripathi and Prof. Sharada Srinivasan. The theme of the panel discussion was **“Retrospection and Future Plans”** in which each panelist was requested to present their thoughts for future plans for archaeometallurgy in view of the two-day workshop.

Prof Vibha Tripathi emphasized that proper training in instrumentation and modern analytical facility to the archaeologists and direct involvement of metallurgists is necessary for the discipline. She also emphasized on the welfare of tribal people because they are national owner of the resources of the region in which they are present. Prof. R.S. Bisht emphasized the need of provenance study of metal in order to know about networking of cultures and interaction within different cultures and a database of compositional character of different mining ores should be created which can form part of a museum. Prof Ashish Garg emphasised over the need of exchange of ideas, training of staff and students, collaboration between archaeologists and metallurgist. He further emphasised that creation of a museum can boost up archaeological studies which can be a centre of not only recreational purposes but also for education and training purposes where some of the lost techniques can be demonstrated at smaller scale. Creation of specific dedicated website, blog or

discussion forum where all these ideas and generated information could be shared online is essential.

Prof Sharada Srinivasan focussed on job prospects in archaeometallurgy, laboratory engagement, collaboration between several institutions for tapping their instruments and specialities. She told that masters and doctoral students can be engaged in archaeological studies and essential facilities can be provided on sharing basis to those students.

Dr S.B. Ota from Archaeological Survey of India told that in future we should involve officers of science branch of the ASI. He further told that hands-on training on instruments for participants is essential for proper training. He told to create a database of metals in order to facilitate provenance study of metal artifacts found at archaeological sites. He further stressed on collaboration with ASI to create database and he added that documentation and study of traditional metallurgical practices is essential for archaeological studies.

Prof. Dube stressed on the role of education and revision in university curriculum for creating a pool of experts and in this regard the role of Institute of Archaeology of the ASI is also important. Prof. Dube also emphasized on the necessity to create a state of the art laboratory with various facilities to carry out archaeometallurgical studies and the need to create a database. He added that it is essential to educate students in archaeometallurgical activity and we can put some archaeometallurgical topics and experimental part in undergraduate and post-graduate curricula. Prof. Danino highlighted on the need to share resources and collaborations can help in this regard. He also suggested some topics like Metal and Mining technology of Harappan people, Ganges and Vindhyan people. He further expected the need of involving tribal people in the archaeological experiments. In response to Prof. Danino observation, Prof S.P. Mehrotra shared his experience of involving traditional knowledge of tribal people to enhance the efficiency of metallurgical techniques at NML Jamshedpur and NML helped tribal people in making more efficient furnaces.

Prof. Ranganathan highlighted on the various efforts initiated by him and his colleagues in the past for various archaeometallurgical studies. Prof. Ranganathan also emphasised over the need of knowledge bank and information sharing via blogs and websites. He also stressed on the need for creation of museum is vital for archaeology at IITGN. He told that strong collaboration within peer group of scientist from different institution like NIAS, IIT Kanpur and IITGN and international collaborations can give meticulous results.

Prof. Sangal told that his department and IIT Kanpur have a large number of characterization facility which can be utilize for archaeometallurgical studies. Prof. Sangal also emphasised over development of new methods for characterization of artifacts. Prof. Kharagwal told about the need of proper training of people engaged in scientific archaeology. Prof. Mondal told that there is a need of stipend for people engaged in archaeometallurgical studies rather than providing fellowship to eminent persons.

On his concluding remarks, Prof. S.P. Mehrotra highlighted the need for effective collaborations, creation of courses in IIT system that can be useful for the archaeologist, urgent need of change in curriculum in educational institutions which are traditionally teaching archaeology as a subject, flexibility in changing subjects for higher studies, database creation is feasible and can be created at IITGN.

The participants were distributed with the certificates during Session VII, which was also the Valedictory Session. Prof. Michel Danino presented the vote of thanks.







