

by Dr Robert B. Faltermeier

Aside from determining the condition of art works, conservators are also frequently asked to ascertain the authenticity of objects. Such a task is usually quite complex as it involves careful inspection of a work that has been in use over generations and is a part of a living environment. In order to arrive at a



Before conservation and analysis

An Antique Buddha *Tested*

conclusive result, these works of art have to be scientifically analysed. In most cases this is done through destructive sampling, such as in Thermoluminescence, Radiocarbon dating, and Electron Scanning Microscopy-EDX.

An alternative approach to sampling, by using non-destructive analytical equipment, is proposed here. In the case of the art work analysed, industrial techniques and equipment readily available in the Asian Pacific region were applied. Working hand in hand with specialists in the physical sciences, and applying archaeometallurgical and forensic science, some light on the history of this particular art work was shed.

The artefact is an Arakan Seated Buddha. It is believed to have originated from around the 16th or 17th century from Burma. The figure is 102 mm high and its surface has been recently reworked. The newly applied gilding is so extensive that any definition and detailed features of the face and other parts are completely lost.

Closer investigation using a binocular microscope indicate a black-brown lacquer layer underneath the gold paint.

The lacquer that covered the metallic surface of the Buddha, however, did not extend into the hollow cavity on the underside. The underside displayed oxide corrosion found on archaeological bronzes. After discussion with the owner it was decided to remove the recently applied lacquer and gilding.

The “original” surface showed up several surprises. The body up to the neck is a light coloured silvery bronze. The head is of a pale yellow copper colour and the prominent bump on the top of the head (*Ushnisha*; which refers to Buddha’s wisdom and openness as an enlightened being) is of a yellow, slightly green tinted colour. The body up to the neck is very rough and is covered in pitting corrosion. This type of corrosion is to be expected from an archaeological bronze. The corrosion pits are lined with the natural occurring black copper oxides.

The upper part of the chest, shoulder, neck and head, are covered with scratches from filing and working the surface. There are two sets of scratches. The first, only found on the body, has the same black oxide corrosion as the pitting. This

indicates that they are from the same period as the pitting, and therefore ancient. The second set of scratches increases along the neckline and run from the chest, over the cast line into the head and are not corroded at all. This means that they are more recent.

Due to the variations in colour and corrosion present on the surface, it was decided to analyse the metals that were present. Qualitative XRF analysis was undertaken to differentiate the alloys present.

The analysis revealed that the body is a classical copper-tin-lead alloy with traces of silver. The head is a copper-tin-zinc alloy and the tip of the head a copper-zinc alloy. The complex composition of the tip raises the question as to how it is related to the head. To find out how the Buddha was constructed, the sculpture was x-rayed.

The x-ray revealed some of the technology used. The centre of the body and legs were found to be less dense in composition, indicating as with other classic bronze works, that it was created by the lost wax casting process. The head is very dense in comparison to the centre of the body and is therefore made from a solid cast. The tip according to previous metal analysis is clearly a different material and the x-ray reveals that the metal was inserted into the head at a later point, probably by drilling the head after it was cast on to the body.

The body with its corroded surface and oxidised original tool-marks is naturally corroded. This type of corrosion is frequently found on bronze sculptures discovered during excavations. The head, however, was cast at a much later date. It does not reveal any kind of corrosion and the tool-marks are post corrosion of the body of the Buddha.

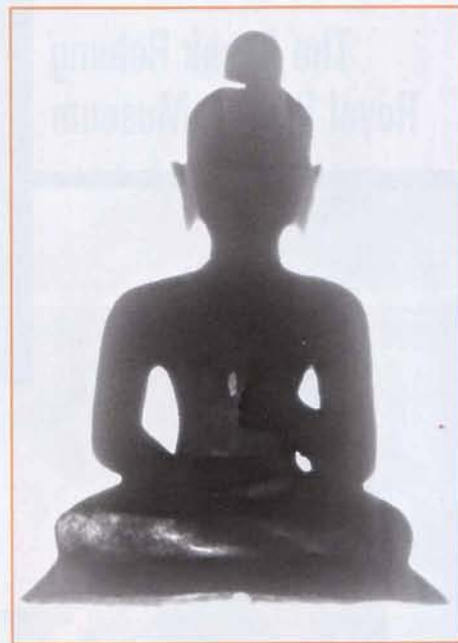


After removing the gilding

The surface of the head and the original shoulders were levelled recently by filing, and this is indicated by absence of corroded tool-marks on both surfaces. The tip of the head was inserted into the head through a hole, probably drilled into the top of the calotte after the head was cast onto the body. Like the head it does not display any corrosion, which would be expected on an ancient bronze surface.

NON-DESTRUCTIVE ANALYTICAL TECHNIQUES

The restoration or renovation of a Buddha is an old tradition still practised today. The re-lacquering and re-gilding of the surfaces have been done for centuries. Visually it is therefore not easy to ascertain which parts of an art work are new or old, or if an artefact is authentic or a reproduction. In the present case conservation knowledge and non-destructive analysis using X-Ray Fluorescence and X-Ray Radiography,



X-Ray of the bronze Buddha

have indicated components that are antique and parts that are recently added on. It shows that non-destructive analytical techniques can be a very valuable tool in determining the technologies applied in the past and clarify discrepancies in material and deterioration processes found in an artefact. These techniques are less time consuming than destructive-sampling since they do not damage the original substance of an artefact. They also do not require sample preparation and restoration of the sampled area after the analysis.

Dr. Robert B. Faltermeier completed his Ph.D. in conservation at the Institute of Archaeology, University of London. Presently he heads a conservation-restoration and consulting firm in Singapore. The company specialises in the preservation of antiques and modern sculptures.