Measuring Artifacts

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Measuring Artifacts

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1. What's an artifact? How do we measure it?

The term "ruins" is used to refer to those locations where evidence of some kind of human activity from the past remains. Of the items excavated from such a ruins, there are those that cannot be moved from the ruins, immovable "estate" such as housing, graves, channels and roads, known collectively as "remains". By contrast, those items that can be removed, the movable assets, are referred to as "artifacts".

Artifacts can be classified according to what they are made of: stone tools, wooden articles, earthenware, ceramics, bone tools, jade artifacts, bronze ware, ironware, glassware, and so on.

In archaeological research, the act of surveying involves the measurement of the position, shape and size of ruins, remains and artifacts, and the preparation of drawings according to those measurements. Of course, ruins, remains and artifacts have three dimensions, but there is no method available to us to record, archive and present this information in its original three dimensions without making scale models. Normally, therefore, three-dimensional information is transformed into two dimensions and subsequently documented as a 2D diagram.

2. Documenting artifacts

Methods other than measurement can be applied to the documentation of information on artifacts—photography, rubbings, written descriptions. Each method has its own advantages and disadvantages; using them in conjunction with one another will result in a more complete record.

Photography and rubbings, in that the subjective opinion of the observer plays no part, allow the documentation of artifacts exactly as they are. It can be said, for example, that a drawing made from actual measurements can never express the color and tone of the surface of an artifact. With photographs and rubbings, however, information will be captured that is not directly related to the production, use or disposal of the artifact in question, such as dirt that became attached to the artifact while it was buried underground, damaged areas caused by the excavation of the artifact, or traces remaining from when the artifact was repaired.

Written descriptions, by contrast, can be characterized as being the expression of the subjective interpretation of the observation. Imagine, for example, a certain wooden artifact has a noticeable indentation. It is not possible to automatically assume from a photograph or a rubbing whether that indentation was present in the wooden material used to fashion the artifact, whether it was the result of the use of the artifact, or whether it was caused by another object pressing into it after both artifacts had become buried underground. The observer will make those judgments based on such information as the conditions of excavation and comparison with other artifacts.

Measurement, however, is located midway between photography/rubbing and written descriptions on the objective-subjective scale. For example, it is the task of the observer to determine whether "damage" to the surface of the artifact is related to the production or usage of the artifact, in other words if it is an attribute of the archaeological material itself, and if so, to take only that information as relevant.

3. Before taking measurements

In those cases where an artifact is severely decayed or damaged, to the extent that it will be difficult to pick up, it is sometimes the case that documentation of the artifact will be conducted at the excavation site, but more often measurement is carried out once the artifact has been removed to a sorting and storage room. Having said that, it is not the case that items can be immediately measured on relocation from the excavation site. There are a number of tasks to be completed first.

Firstly, dirt on the surface of the artifact must be removed. Normally, a brush is used to wash the artifact with water, but this may cause some artifacts to crumble or the surface of the artifact to melt away. Failure to take due care

when washing artifacts may also result in marks resulting from production and usage being washed away. The state of the artifact should be carefully considered, therefore, before washing. In those cases when the brush is not sufficient to remove the dirt on the artifact, an ultrasonic cleaner may be used.

The washed artifacts should then be carefully dried before labeling. Use a fine-point brush and black ink or poster colors to note relevant information (excavation date, site, grid number, remains number, artifact number, etc.) on the artifact surface. The location of the labeling should be carefully selected so as to not hinder photography or measurements.

It is rare that artifacts excavated from ruins retain their original and complete form; normally they are excavated in pieces. These pieces are rejoined using adhesive. For those artifacts which may be rejoined in their entirety, labeling may follow the rejoining process. For earthenware, ceramics and clay figures, however, once as many pieces have been rejoined as reasonably possible, repair work should begin. Missing pieces should be replaced with plaster pieces, recreating the original shape of the artifact.

For metal and wooden artifacts, the artifacts may deteriorate rapidly after excavation; as such, conservation techniques are required. Some conservation techniques, however, may result in changes to the shape and color of the artifact, or changes that result in marks on the surface becoming invisible. It is preferable, therefore, to take photographs and measurements before conservation techniques are applied.

4. Tools for measurement

Taking measurements requires a number of tools. First, the paper. 1mm quadrille-lined paper is standard. The paper size to be used will depend on the size of the artifact. For something like a wooden artifact that has become soaked with water, use a Mylar base to ensure that the paper does not rip or stretch.

To make measurements, you will need rulers. Use straight edges rulers, set squares and T-squares as required.

Use a divider to measure the distances between measuring points, a caliper to measure wall thickness, a side gauge to measure the inner diameters of holes. Where there is any risk of damaging the artifact, it is best to use rulers made of carbon fiber or plastic.

Contour gauges can be useful for copying the outline and shape of artifacts. In artifact measurement, bamboo contour gauges are often used, but bamboo contains silicic acid that may damage the artifact, so it is best to exercise caution.

Elsewhere, the material, size and shape of the target artifact will dictate which tools should be used to complete measurement. Where measurements need to be made at sites overseas, it is often the case that the conditions where measurements are to be made are unfavorable and the nec-



Figure 1 Taking measurements
Measuring a wooden article, an oar (*zhao*), excavated from the Mount Tianlou site in Zhejiang province, China. The lighting inside is poor, so measurements are being taken on the veranda of the site office.

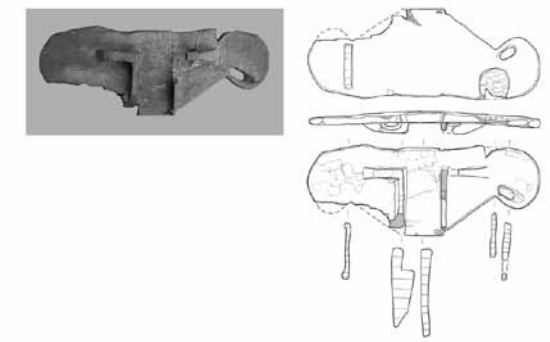


Figure 2 An example of artifact measurement
Photograph and measurement drawing of a butterfly-shaped wooden artifact excavated from the Mount Tianlou site. Marks carved on the surface of the artifact, hard to capture with photography, are indicated on the measurement drawing. By schematically representing the annual growth rings in the cross-sectional view, it becomes possible to tell which part of the tree was used to create the artifact.

essary tools are unavailable. Before bemoaning the fact that with no tools you cannot conduct any measurements, you should be innovative with the tools that you do have, or even, when required, be flexible enough to create something from scratch.

5. Taking measurements

The methods used to take measurements vary according to the type and state of the target artifact, and it is not possible to mention them all here. Here, we will limit our discussion to the basic methods and rules.

Orthographic projection is one method of representing a three-dimensional object in two dimensions. In this method, the object is projected onto one horizontal plane and two intersecting vertical planes. This explanation may make it seem rather difficult, but simply put, it is like putting the target object in a transparent three-dimensional case, and then copying the various dimensions of the object onto the six sides of the case. To be a little more precise, it is the process of drawing an object from the front (and back), the sides (left and right) and the top (and bottom). The resulting drawing has six sides: front, back, left, right, top and bottom. It is unusual, however, to create drawings of all six sides; some may be omitted as appropriate, or replaced with a cross-sectional diagram. Other methods may also be used as required, such as auxiliary projection views (view from a separate angle), development views or partial enlargements.

Let us now look at how to take actual measurements, using the example of an earthenware artifact. To make matters simple, let us assume that the artifact is a solid of revolution with a parallel rim and base. In the case of a solid of revolution, the front, back, left side and right side images will all be identical. For the surface and bottom views, the rim, the most pendent part of the body, and the outer lines of the base will all be concentric. As such, it should suffice to create one elevation view.

Spread quadrille-lined paper over a flat surface, and place the artifact on top with the base at the bottom. The rim and base are parallel, so seen from the side the rim should appear as a straight horizontal line.

To draw the outline of the artifact, select a number of measuring points, and measure, using the appropriate tool from your selection of rulers and measuring items, how high each point is and how far each point juts out (or concaves) in relation to the external edge of the base. Mark the points you have measured as dots on the paper and this will allow you to copy the outline of the side of the artifact. It is not possible, of course, to have limitless measuring points, so ordinarily measurements will be taken at characteristic points on the outline, while a contour gauge is then used to note the contours between measuring points; this data is then recorded onto paper. Any marks on the artifact remaining from the time of production or any deliberate patterning should be carefully measured using a divider and added to the elevation view.

I did state earlier that for a solid of revolution a single elevation view would be sufficient, but it is still not sufficient to simply denote the features and patterns on the exterior of the artifact. This would result in other information being overlooked, such as wall thickness and whether there are any marks on the interior of the artifact. Therefore, the elevation view is bisected, with the left half showing the exterior and the right half showing the interior and a cross-sectional view. This is a discussion of fundamental principles, however, so if the right and left sides of the exterior of an artifact were to show asymmetrical patterning, the drawing of the exterior may extend past the central line and into the right side in order to show the asymmetry. Furthermore, if the front and back of the artifact show different patterning, then it will be necessary to create a development view in addition to the elevation view.

Incidentally, the standard in Japan is to use the left side for the exterior and the right side for the interior, but this is opposite to standard practice in the US, Europe and China. For remains located overseas, you will need to consider keeping in line with standard practice in the relevant location.

6. After taking measurements

It is important to store completed measurement drawings in appropriate files, to ensure they are not lost or damaged. Measurement drawings should be given identifying numbers, and these should be added not just to the ledger used for drawing management but also to the ledger relevant to the artifact and to the photography ledger. Doing so will ensure that all relevant items can be retrieved easily when

required.

If a measurement drawing is to be included in a report, it will be necessary to trace the drawing. Use a tracing pen to trace over the drawing, having determined scale and layout in advance and use the resulting trace as the artwork for your report. Today, it is possible to scan the traced drawing or indeed the measurement drawing itself and use image-editing software to prepare the artwork for your report.