

Restoring ceramics

part I

1. Before starting the restoration of an object, it is necessary to conduct a precise and thorough analysis of its condition in order to be able to select the procedures for its restoration. It is advisable to gather information about the object: its origins, historical and stylistic classification, material and production, dimensions, special characteristics, damage and state of preservation.

2. Causes of damage are:

- a. of chemical origin: caused by the interaction of the material the object is made of, water and various chemical substances; it affects the surface of the object.
- b. biological origin: consists of microorganisms and plants that take hold on the surface or the pores.
- c. physical: caused by mechanical, thermal or electrical factors.

3. Forms of damage:

- a. efflorescence: the most destructive for porous ceramics; is caused by salts present in the body dissolving in water and migrating to the surface, where the water evaporates, the salts crystallize and establish themselves there. If the object is glazed, the salts can spread between the body and the glaze causing the latter to flake off. The most common salts are: sulfates, chlorides, carbonates and nitrates of sodium, potassium and magnesium.
- b. detachment of angrabe and glaze: caused by efflorescence provoked by moisture (see above); mould accelerates the process.
- c. black *stains*: caused by direct contact with the fuel during firing; cooking utensils may have a black patina caused by using them in the fire or marks of burned food; slipped or glazed earthenware have black cracks caused by the absorption of organic substances; white glaze may be blackened by the transformation of lead in the glaze into lead sulfate.
- d. *metallic stains*: caused by old restoration work (metal staples, wrapping with wire) which have developed rust and damaged the original; a metal object adjacent to the ceramic object (excavations); the products of oxidation form deposits on the surface and penetrate into the glaze and clay body.
- e. *warping*: may occur if the piece was fired too hard; another cause of distortion is the release of tension in breakages: at the moment of the break, the tension is released that may have built up during the making, drying, firing or cooling.
- f. cracks and *breakages* may occur
 - during firing due to rapid temperature rise or insufficient drying before firing;
 - having received a blow before firing
 - after firing when an object is dropped or in use

Breakages to terracotta objects have crumbly edges. In a glazed pot lots of splinters occur along the break because of the tension between the body and the glaze. Porcelain may break without splintering because the material is homogenous.

g. *missing* fragments

Fragments of a broken object are not always possible to be found; excavated pieces are rarely complete.

- h. *old restoration work*: must be removed if it has been poorly executed or is faulty, the material is discoloured or the repair itself has broken

part II

It is essential to execute every step of restoration work very carefully:

- if fragments are not sufficiently clean, they will not fit together;
- too much adhesive produces too much volume and prevents the fragments from being perfectly reassembled;

- a reconstruction of a form that has not been properly smoothed becomes more obvious after it has been coloured.
- the pieces have to be thoroughly dried before the next stage can begin.

All materials used should affect the original as little as possible and should be reversible. They should match the original with regard to texture, thickness and strength.

1. Cleaning is the first stage of the work which includes: dry or mechanical cleaning, wet, and chemical cleaning.

Dry cleaning starts the operation. With the assistance of soft brushes or rags, the dirt is carefully removed taking care to avoid pressing the particles of dirt into the pores. Stubborn dirt can be removed with a scalpel, clips and staples with fine drills.

Wet cleaning can be done locally or in a bath, with an appropriate solvent. If a specimen is in a stable condition, it can be soaked in water (demineralised or distilled).

Cleaning with **chemicals** must be done with the greatest care as it is difficult to control. Tests must be carried on unobtrusive parts of an object.

- lime efflorescence can be removed mechanically or with diluted acids
- organic residue found e.g. in cooking vessels with organic solvents
- metallic stains with a weak acid solutions.

Removing old restoration work also falls within the field of cleaning. Wrongly assembled pieces can be removed with small handsaws or drills; old glue by heating the appropriate place over a flame or in a water bath; and if the adhesive is not soluble in water, solvents are required.

2. Consolidation

If the clay body is porous or if the glaze is flaking off, the object has to be consolidated. Paraloid B72 is an artificial resin that can be dissolved in various solvents in different concentrations. The resin is applied with a brush, a spray gun or by complete immersion.

3. Reassembling and the use of adhesives

The first step is to consider meticulously the correct order to proceed. The restorer spreads out all the fragments and studies the fit and logical order in which they should be reassembled.

When the correct positions have been found for the individual pieces, they can be held in place with strips of adhesive paper if the surface texture permits. Fragments can also be numbered to note the order in which they are to be assembled. It is advisable to join smaller pieces together to form large fragments so that ultimately there are 2-3 large fragments that can be fitted together in a final step.

4. Patching

At this step it must be decided if the joints between the separate fragments and the missing pieces should be patched. If the joints spoil the aesthetic appearance of an object, they can be filled in with a suitable colour. Missing parts usually upset the overall appearance of an object so it is advisable to patch them, but only if it is certain that the repaired form corresponds to the original.

A negative form is modeled or a cast is made to fit the gaps. After drying patches are smoothed with files, scrapers and sand paper to match the original perfectly.

5. Matching colours

Applying colour emphasizes irregularities so it is essential that joints and patches have been executed well. Brushes, small sponges or a spray gun are used in colour application. Before starting, colour samples should be made.

Only the patch must be coloured; the original material shouldn't be painted over. If the restoration work is for a museum, a slightly more restrained colour than the original should be used. It should definitely be unobtrusive. For the antiques trade, however, if the repair is to be concealed, the colour may spread over part of the original piece.