

All copper and copper alloy objects, e.g. brass and bronze, on exhibition or in storage in a museum require periodic maintenance and cleaning.

Cleaning enhances the appearance of copper objects, and helps to reduce further deterioration by removing sources of corrosion such as grease, dust, metal polish residues, and fingerprints. Polishing, by contrast, is an abrasive operation that removes tarnish and some surface metal.

When cleaning a bronze object, the first consideration is whether or not it should have a polished appearance. Many items, such as cookware, acquire a stable tarnish during use. Others, such as medals and statuary, may have been artificially patinated when made. Still others, such as scientific instruments, have coloured lacquer coatings that are an important feature of their original appearance. Some "bronze" statues from the late 19th or early 20th century may have been cast in a soft white metal and "bronzed" with a tinted, transparent varnish. Polishing, or even cleaning with a solvent, could remove this varnish from the high points, thus disfiguring the piece. The patina on Oriental bronzes is highly prized and should never be polished.

**The appropriate appearance for an individual object must be determined by curatorial research and consultation.**

A clear work space is required, with a bench or table, good illumination, and suitable ventilation. A few layers of paper on the table will protect it from stains and provide some cushioning for the object. The paper should be changed frequently to keep the work surface clean. A tray to hold cleaning materials will help contain any accidental spills. A space should also be set aside for making notes.

## **Cleaning**

Before attempting to clean an object, record its accession numbers in case cleaning and/or polishing removes them. Next put on clean cotton gloves to avoid transferring the moisture, corrosive salts, and oils in your fingers to the freshly cleaned and polished metal surfaces.

Begin the cleaning process by brushing away **dry dust and dirt**. Brushes made of hog bristle are recommended, and several types are useful. Conduct overall cleaning with brushes whose bristles are set at right angles to the handle, such as natural bristle toothbrushes (soft or medium) or jewelers' watch brushes. More detailed work can be carried out with round artists' oil painting bristle brushes (sizes 4–6) or stencil brushes. To remove **greasy residues**, apply a mixture of equal volumes of methyl hydrate (methanol) and water with cotton swabs or Q-tips. Where the grease proves resistant, a stencil brush may help. A few drops of a mild detergent added to the mixture will help to cut grease. Always carry out a preliminary test to see if the cleaning solution will remove accession numbers.

**Polish residues** from previous treatments should also be removed. These are usually found as Grey, white, or green deposits in inaccessible areas of the object. If they prove resistant to the procedure described above, use a wooden toothpick moistened with a mixture of equal volumes of methyl hydrate and water.

If you find **waxes, paints, or lacquers** during cleaning, determine whether or not they originate from manufacture or from use of the object, i.e. if they are part of the object's history. The preservation of these layers can be technically difficult, and their removal usually requires chemicals that are both toxic and flammable. These problem cases should be referred to a conservator for advice or treatment.

## **Polishing**

Polishing is an abrasive process. If polishing is necessary, always begin with the mildest and least harmful method.

The gentlest procedure is to lightly rub the metal surface with a paste of precipitated chalk and water on a soft cloth. Next in abrasiveness is jewelers' cloth, which has an outer layer of flannelette and an inner layer of flannel impregnated with jewelers' rouge (hematite), a fine abrasive. Gently and evenly rub the inner layer of the cloth over the surface of the metal, and then remove the residual rouge by polishing with the soft outer cloth.

If jewelers' cloth is not sufficient, consider a wadding-type polish applied with a soft cloth. However, proceed carefully as excessive rubbing could produce noticeable scratches on the surface of the metal. Finish by hand buffing with a clean, soft, lint-free cloth.

Be cautious of commercial polishes. Those formulated for automotive or stainless steel cleaning often contain very hard particles which can scratch the softer alloys of bronze. Some products contain tarnish inhibitors that leave a film on the surface, making further treatments difficult. Many metal polishes contain ammonia, which can dissolve copper in some conditions.

## **Waxing**

A wax coating will provide some protection against both the environment and handling. A suitable wax can be prepared by mixing equal volumes of Shellsol or Varsol with a bleached micro-crystalline paste wax. Ensure that the wax contains no synthetic components, such as polyethylene, as these will make it difficult to remove. This mixture should then be stored in a sealed jar. To apply the wax, wipe or brush it evenly over the clean metal and then set the object aside for the solvent to evaporate. Alternatively, if the metal is not attached to wood, ivory, or other heat-sensitive materials, apply the wax and then heat the object with a hair dryer to melt the wax evenly over the surface and into the recesses. Finish by blotting the object (while still warm) with tissues to remove excess wax.

After the wax has set, buff the surface with a clean, lint-free cloth. A thin layer of wax will remain on the metal. To reduce the need for frequent cleaning, protect waxed objects from dust. When the need arises for further cleaning and polishing, the wax can be removed easily with odourless mineral spirits. This procedure should leave paints, lacquers, and accession numbers unaffected, but it is best to conduct a preliminary test.

## **Lacquering**

Polished copper alloy objects are sometimes lacquered to protect them from handling and the environment. However, museum objects should not generally be treated in this manner. No matter how well lacquer is applied, it always alters the appearance of an object. Also, applying a lacquer is a tacit acceptance of a failure in other areas of protection, e.g. the object is being handled more than it should, precautions against handling are being ignored, or the object is not being cleaned properly after use.

Nevertheless, there are situations where lacquering is an appropriate treatment even if all other possible precautions are taken, especially if the object was originally lacquered and the coating has worn off or been deliberately removed.

There are two potential problems with lacquering. It is difficult to apply lacquer in a very thin yet even coat, and it is difficult to remove lacquer should it be necessary. The first

problem can be addressed by taking the object to a company that specializes in applying lacquers and has the equipment and expertise necessary to do it well. Such companies can also remove lacquers.