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When an object that has been found buried in the ground goes on display in a museum, how well it is preserved will depend on three important factors. First, the object itself – what it is made of, how it was made and what condition it was in when buried, for instance, new, worn or broken. Second, the condition of the ground in which it was buried – this is a complicated matter because different materials will be affected in different ways by the same conditions, but in general the less air there is in the ground the better the object will be preserved. Third, how the object was found – it may have been carefully handled and stored by an archaeologist, or roughly treated by someone who did not have the skill or knowledge to look after it.

Once removed from the ground, an object may start to rot or corrode (rust), so it must be kept in the right conditions and taken as soon as possible to the Archaeological Conservator. The conservator's job is to examine the objects, to uncover and record what can be learned about them, then preserve the objects and prepare the most interesting of them for museum display. An ancient object taken from the ground may be superbly well preserved or just a pile of fragments, but even a badly preserved item can provide a lot of information through careful study and treatment by the conservator.

One of the main reasons why the Coppergate excavations were so important was that the archaeologists found thousands of Viking Age items beautifully preserved by the waterlogging of the ground. In ordinary damp conditions the ground has tiny air spaces in it. Air contains oxygen which causes metals to corrode. The insects, fungi and bacteria which eat organic materials (from plants and animals) like wool, leather and wood, also need oxygen to live. In waterlogged ground, however, all the air spaces are filled with water and there is very little oxygen, so objects that are many centuries old can be remarkably well preserved when taken out of the ground.

Barrel padlock from the Coppergate excavation



before conservation



in x-ray



after conservation

On Coppergate, we found that objects made from pottery, glass, stone, bone, antler, ivory, jet, shale and metals, were all much better preserved than they would have been from a drier site. Sometimes brass, like that on the Coppergate Helmet, came out of the ground looking bright and shiny like gold, and some iron knives were so well preserved that we found file marks on the blades. But perhaps the most striking finds from Coppergate were those made from wool, leather, horn, silk and wood, which would not have survived at all on a drier site. Unfortunately organic objects such as these quickly dry up in the air and shrink, crack and fall apart if they are not treated properly.

The conservator's work, then, begins on site, making sure that all the objects are carefully handled and correctly packed, and sometimes even excavating, lifting and packing very fragile or difficult objects. Back at the laboratory, the first task is to decide what the object is made of, how it was made and exactly what condition it is in; this is done by examining it under the microscope and carrying out tests. Sometimes the iron objects are so altered by corrosion that X-rays have to be used to discover their true shape before the conservator can begin the next task -finding the surface of the object.

Some materials, such as bone, stone or glass, may just need the dirt washed off, but harder deposits may have to be picked off. Metals are more complicated because when they corrode

some of the corrosion takes the place of the metal while other corrosion forms a crust around it. Only this must be removed, since the corrosion beneath is part of the object and can still show its surface detail. Chemical cleaning is usually avoided because it is difficult to control and can affect the object itself, so the work is done by hand, very painstakingly under the microscope, to make sure that no damage is done and nothing is missed. A wide range of tools is used, including brushes, scalpels and even dental drills!

Everything which is discovered about the object is recorded in writing or by photography. Sometimes even the outer crust may contain information about the object, in which case it, may have to be left on, or saved separately.

The next stage is to 'stabilise' the object so that it does not decay any further. A fragile item may be treated with resin to make it firmer and stronger. The water in waterlogged objects must be removed in such a way that the object is not damaged. With wooden objects this can be done by soaking them in a-water soluble wax, which replaces the water. To prevent metals from corroding, any harmful substances trapped in the corrosion must be removed or made harmless without causing any further damage. Broken objects will be stuck back together, and missing areas filled in to strengthen them, using only materials which are safe and which can easily be removed. If an object is to be displayed, all the missing parts may be filled and coloured so as to show what it would have looked like when it was complete. Very careful records must be kept of everything that is done so that it is always clear which parts of an object are original and which have been restored.

Finally the conservator has to make sure that all the finds are stored and displayed under the right conditions, so that all the good work is not undone!



Mechanical cleaning of an object under the microscope