Marina Lykiardopoulou
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CONSERVATION OF NUMISMATIC COLLECTIONS

Marina Lykiardopoulou
Numismatic Museum, Athens

Coins constitute a rich source of information of our past, a rich field of study for a lot of disciplines. They are valuable finds for the archaeologists since these can date the contexts in which they are found. They can also contribute to the confirmation and to the more global consideration of a number of archaeological facts.

Coins constitute a very important source for the historian since history is unfolding through the emperors' portraits, the legends, the representations etc. Political and economic studies are also benefited since the coinage of a country illuminates its political situation and its economic development.

The artistic taste of each period or of a special country is also reflected in their coins. They offer a wide field of study and experimentation to the metallurgists due to the variety of alloys and techniques used and due to their existence in a great number of duplicated items. Coins, which form a particular category of archaeological or historical objects, are probably more suitable than any other class of objects, for interdisciplinary analysis.

However, this research would be impossible and the collection and presentation of coins would be pointless without conservation, which, in a modern scientific approach, works alongside these disciplines to bring out all this information, while on the other hand, it keeps in mind the obligation to preserve the coins for the future. Consequently the conservation of coins should not be considered to be a routine and superficial job with quick results as it very often used to happen in the past; this simply will not meet with the requirements of today's science.

Conservation is a rapidly developing field due to the world-wide interest in cultural heritage and the explosion of scientific knowledge. It has escaped from its old philosophy where the result mattered more than the respect to the object itself. Today conservation work is guided by principles and rules resulting from international meetings and conferences. Clear concepts guide the practice which entails the application of manual skills and scientific knowledge, together with artistic and historical sensitivity.

Conservation is based on material science and includes mainly: the systematic study of the mechanisms of deterioration, a good knowledge of the materials and techniques used for the manufacture of the objects, and the study of the materials we use for their conservation. It is a battle against

all forms of decay but we can only decrease its speed since decay is a law of nature, and it cannot be absolutely stopped. Conservation today has been established as a discipline with various specialities such as: conservation of stone, ceramics, glass, wall painting etc.

The conservation of coins is the microcosm of the conservation of metallic artifacts. Every problem or every intervention is of a smaller scale but at the same time coins provide the conservator with a wide field for research due to the reappearance of the problems and the coins themselves. The most fundamental responsibility of a museum is the preservation of its collections and conservation is the technology by which preservation is achieved. The conservation is divided into two main parts: preventive conservation and treatment.

PREVENTIVE CONSERVATION

This term entails the study and control of the causes of deterioration of museum objects in order to prevent or minimize damage to collections. The major causes are environmental light, temperature, humidity and atmospheric pollutants, including chemical damage due to the contact or close proximity of the object to reactive materials used for storage or exhibition. The list includes the causes which affect coins only.

Humidity is the main cause of damage to all metals and consequently to all coins. Moisture plays an important part in most chemical processes of deterioration. It favours the corrosion of metals. The most sensitive metals are copper and iron. Iron rusts and copper which usually contains chlorides, presents spots of active corrosion, the characteristic bright powdery green spots of bronze disease.

The amount of moisture which is in the air is measured with the term Relative Humidity. This is usually expressed as a percentage and it can be defined as follows:

$$RH = \frac{\text{amount of water in a given quantity of air}}{\text{maximum amount of water which the air can hold at that temperature}}$$

Thus for example 1% is a very dry environment while 99% is a very wet one. The RH depends on the temperature. When the temperature rises the RH decreases and vice versa. The RH levels must be correct for the good preservation of the different classes of materials. Metallic artifacts are better preserved in very dry environment with RH levels below 40% while the iron objects need much lower RH levels below 20%. It is very important that the

RH levels must be kept constant throughout the year. Fluctuations of RH put the objects in danger.

The instruments with which the RH is measured are called hygrometers. There are simple and small instruments which can be put inside the showcases but they present many disadvantages. Since RH varies between day and night or between seasons, the use of an instrument which can measure and record at the same time the RH and temperature of one day, one week, one month is essential. These instruments are called thermohygrographs.

The control of RH can be achieved with a central unit distributing fully conditioned air through ducts to all parts of the building or at least to all exhibition or store rooms. When no central unit exists we can use separate equipment to control it. In the case of coins we use the dehumidifier which works automatically and can be installed either in the store or exhibition rooms.

The regulation of RH inside the showcases can be achieved either by connecting the central system or dehumidifier with the showcase or by using desiccants in the showcases. Dry silica gel is the most simple example. The disadvantage of these substances is that they need regeneration when they absorb moisture.

Temperature: temperature affects the RH and that is the reason, why it must be controlled and kept on a constant level. The desirable temperature is 20°C. Its control is achieved by using thermostats in the central duct system.

Light: the objects which are highly sensitive to light are water-colours, textiles, etc. Coins can be affected only indirectly by light. Light, which may come from the sun's rays or a light source inside the showcase, can raise the temperature of the objects temporarily. When they stop, the temperature will fall again. Fluctuations of temperature result in fluctuation of RH. The sun's rays can be easily eliminated in some acceptable ways (stores, curtains, Venetian blinds, etc.). When a source of light is used every precaution must be taken to ensure that they do not cause an undesirable rise of temperature inside the showcase.

Atmospheric Pollutants: sulphur oxides and chlorides, together with oxygen and humidity which exist in the atmosphere, have a strong corrosive effect on metals mainly copper and iron. Silver is attacked by hydrogen sulphide which is in the atmosphere as a result of organic decomposition. The concentrations of these pollutants vary depending on the museums'

location. Obviously the situation is worse in towns or industrial areas than it is in the countryside. In coastal areas the air contains chlorides.

Suspended particles such as dust, grit, and soot settle on the surface of the objects and can absorb moisture and air pollutants accelerating corrosion rates. There are special filters which can hold these contaminants. They can be installed either in the central air distribution system or individually.

Another possible source of pollution in showcases or storage cupboards may be the materials used in their construction. Certain materials may give off small amounts of volatile sulphur compounds that cause extensive tarnishing on silver and bronze coins. They also evolve small amounts of organic acid vapours that attack certain metals in particular alloys containing lead and zinc. Such materials may be wood, cardboard, rubber, various adhesives and dyes, textiles, etc.

Nowadays, a lot of research has been carried out concerning this problem and a rich bibliography with the results of this research is available. Nevertheless the general rule is that all materials should be tested for their suitability before use. It is also advisable to avoid these materials as they are considered to be suspicious. Consequently, we have to bear in mind that the basis of prevention is the regular inspection of our objects.

TREATMENT

Methodology and scientific approach should rule any intervention for the treatment of the object. The application of science, as well as some of the recent technologies available to conservation today, has given a great impetus to this. The stages of treatment are: examination - recording - diagnosis - action - recording - care.

It is obvious, that for the best possible results for a systematic successful conservation program a well equipped laboratory is a basic presupposition. The other one is well-trained, specialized and skilled conservators.

Examination: all treatments must be preceded by a detailed examination which aims at the thorough understanding of the object in all its aspects. This examination will answer the many questions about the kind of alloy, the technology of its manufacture, the determination of the corrosion products, the softness or hardness of them, whether or not the corrosion is active etc. During this examination conservators very often give answers to questions about authenticity and this is another contribution of conservation to the research and study of coins.

This research will help the conservator to decide on the best treatment to solve the specific problem and to take the consequences of every action into account. Such an examination cannot be achieved by the naked eye or by means of a magnifying glass.

The most accurate answers can be derived from physicochemical methods of analysis such as: X-ray fluorescence, X-ray diffraction, radiography, P.I.X.E., neutron activation, electronic microscopy, etc. Their application on coins has given a great impetus not only to the conservation but to their study as well.

When such possibilities are not available there are some simpler means which will help the conservator to get his answers. First of all, the stereomicroscope with high magnification, simple chemical spot tests, the use of electronic balance for the determination of specific gravity of coins. Radiography can be added here since there is simple and safe X-ray equipment which has been used by the conservators for many years for the examination of coins.

Recording: the keeping of records should be a standard rule for scientific and administrative reasons. This should include both written records for every stage of work done, with materials used, dates and names of individuals responsible, and photographic documentation as well. The keeping of records, contribute to:

1. The study of the object itself because of the thorough details they include. Sometimes during treatment certain elements are discovered which escaped the close observation of the numismatists.
2. The progress of the conservation discipline. Without complete recording, the success or failure of a method cannot be estimated.
3. The information for future generations about the materials and methods used. There are different kinds of recording, like specially printed cards, files etc.

The computerized system is used extensively today and offers wide abilities not only to the keeping of records but to the exchange of conservation knowledge and research as well.

Diagnosis: the decision for the action is taken after the estimation of the above and the thorough understanding of the problem.

Action entails the following steps: cleaning, stabilization, and repair. Each coin or each category of coins involves special problems which dictate their

treatment. The choice for a process or processes depends on many considerations:

a) The alloy and techniques used for its manufacture. Is it a silver alloy or a copper one? Is it a silver plated or silver washed coin which preserves only traces of the noble metal on its surface?
b) Is it an archaeological coin coming from an excavation or a historical coin which has never been buried in the ground?
c) Is the coin heavily corroded or in good condition?
d) Is the corrosion active or not?
e) Is it required for archaeological dating?
f) Apart from identification, will there be any analysis required?
g) Is it destined for display or reference collection?

The answers to the above questions and many others will determine our decision.

Cleaning of coins is a delicate job. Injudicious rubbing and scraping can result in irreparable damage to the detail of the coin or to the loss of probable traces from the burial environment such as wood or textile. We can also lose valuable evidence where surface enrichment or silvering is contained only in the corrosion products.

This is the reason why the most controllable methods are preferred for the cleaning of coins. The most eligible one is the mechanical cleaning with simple mechanical tools and the aid of the stereomicroscope which is considered to be the conservator's eye. It is the only method which ensures the preservation of patina, a desirable aim of conservation which is a principle as well. Other methods, for example chemical cleaning, electrolysis, air abrasive although they are not easily controllable, can be applied as occasion serves.

The next step is the stabilization of the material in order to impede the deterioration of them. By using certain methods or chemicals we try mainly to extract or inactivate chlorides which are the main cause of corrosion for most alloys.

Repair: coins rarely need repair.

Care: finally, care includes the covering of coins with a suitable (transparent, durable, inert) varnish to protect them from further decay. Obviously the appropriate storage and display conditions mentioned above must be strictly applied. The materials we use during the treatment of coins must be reversible, which means that we must be able to remove them any time this

is required by modern discoveries and this is another principle of conservation. In conclusion, the conservation of coins is a basic presupposition not only for their collection and presentation but for their study as well.

Consequently the approach to the subject should not be determined only by a certain method or by the purposes for which it is undertaken (e.g. storage, exhibition, publication etc.), it should be determined by the aims and ethics of conservation: the collection of the maximum of any available information with respect to the coin's authenticity, bearing in mind the obligation to preserve them for the future.

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