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DISPLAY MATERIALS RESPONSIBLE FOR THE DETERIORATION OF COINS: EXAMPLES FROM THE NUMISMATIC MUSEUM OF ATHENS

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One of the fundamental purposes of a museum showcase is to provide a safe and controllable environment for the objects displayed while simultaneously providing security against theft and mechanical damage, and a visually attractive display.

These three requirements do not necessarily conflict.

The practical problems arising during the designing and mounting of an exhibition can be resolved by adequate cooperation between the museum curator, who decides the kind of exhibition he wants, the designer, who seeks to realize the exhibition on an aesthetic level, and the conservator who advises upon the necessary conditions to ensure the safety of the objects on display.

The rate at which coins corrode depends on many factors: temperature, humidity, atmospheric pollutants, as well as the potentially harmful effects of certain storage and display conditions. The objects of a museum are displayed in closed exhibition cases mainly for security reasons as well as because this affords the possibility of creating more stable environmental conditions. Although this minimizes the effect of atmospheric pollutants and keeps away dust, some materials used in the construction and dressing of showcases release small amounts of gases and vapors which have particularly adverse effects on metallic artifacts since they are very sensitive to corrosive vapors. Furthermore, the concentration of these gases may exist at high levels in this confined space with little or no ventilation.

Hydrogen sulphide (H₂S) is responsible for the tarnishing of silver and polished copper, while organic acids, predominantly acetic and formic are implicated in the conversion of lead into a powdery white lead carbonate. Such harmful materials include: wood, paper, cardboard, rubber, textiles, various adhesives, paints and dyes.

A lot of research has been carried out on this subject and there is a plethora of references in the conservation literature. The following paper will attempt to summarize the results of this research, and, further, will add to this body of evidence by examining the problems faced at the Numismatic Museum of Athens.

Wood has traditionally been used for years as the basic raw material, of museum furniture. Although it is an aesthetically pleasant material, it is absorbent and acts as a buffer against fluctuations of external atmospheric humidity.

Wood is highly corrosive to metals, due to the emission of organic acid vapors.

These vapors may be given off by a variety of timbers, unseasoned or not. Oak is particularly harmful. The only wood which has been used in the past and is considered to be safe is mahogany. High evolution of organic acids occurs when woods are made of layers, blocks, chips, sawdust and surface veneers held together by an adhesive.

Lead and alloys containing lead and zinc are most affected, while copper reacts to form complex corrosion products.

It is well known that lead objects - lead seals, tokens, medals - should never be stored or displayed in cupboards or cases made of wood as the emission of organic acid vapors converts the lead into white powdery basic lead carbonate with the catastrophic result of the loss of valuable information and sometimes the complete disintegration of the object itself.

The damaging effect on the lead seals stored in cabinets made of oak in our Museum in the past was extensive. The conditions in the older display cases, made of oak, were better.

The lead seals presented only slight corrosion on the side which was in contact with the surface of the case. The worst conditions in storage were probably due to the fact that there was limited space between the cabinet drawers, as well as the absence of ventilation.

The materials used for storage were changed in 1977. Since then we have used inert materials (aluminum cabinets and perspex trays) and we have also carried out an extensive conservation project which has succeeded in saving and keeping these objects in a good state of preservation.

Paper and cardboard As cardboard and paper are made from wood, adhesives, dyes and surface finishes, they cause the same problems. Frequently, they are in contact with the exhibits themselves for instance the small discs used as labels on which the coins rest have been shown to be particularly corrosive to lead. At the Numismatic Museum of Athens, we used to tackle this problem by sealing the labels in polyethylene envelopes, although this was only a temporary solution. More recently new inert materials, such as acid-free papers, or plastics like polystyrene and polyethylene, have become available on the market and have replaced the old paper labels.

Textiles are the most common materials used for lining showcases, however they have proved to be particularly damaging to coins which are usually placed directly on them. This is due to their chemical composition and the chemicals used during their manufacture.

Natural textile fibers do not contain sulphur, and are relatively inert in their raw state, except wool. Cotton and linen are safe materials while wool and felt emit hydrogen sulphide due to their proteinaceous origin.

This is the main cause of the tarnishing of silver, gilded silver and polished copper. Silk, however, contains no sulphur and is considered to be safe.

The fabrics which do not cause corrosion problems include; plain terylene, nylon, polyesters, polyethylene. However, some of the chemicals used in processing and dyeing of fibers will cause corrosion of copper, silver or lead. The results of tests on textiles in the past have shown that it is impossible to be sure whether a textile will be safe or not and it is, therefore, essential to test a sample before use.

For example, Andrew Oddy has conducted research on two shantung types of textile. A green one was found to be safe for the display of silver while the similar blue textile caused the silver to become tarnished. Dyes and finishes can be changed by the manufacturer even when the fibre content and appearance of a textile remains unchanged.

Our experience in the Numismatic Museum of Athens has shown that pure un-dyed silk with which the old showcases were dressed is a safe material, while a blue velvet with which a wall-mounted show case was dressed caused the rapid and extensive tarnishing of modern silver and copper coins.

For the new exhibition, which is still not open to the public, the designers' decision that the textiles in the show-cases be of a similar color to that of the existing wall-paintings presented problems for us. We tackled these problems by first buying several meters of a natural unbleached cotton fabric, and subsequently co-operating closely with the chemists from a well-renowned pharmaceutical company in order to choose suitable inert dyes which would give us the tones of colors that the designers requested. Afterwards, we tried to find a dye manufacturer that would be prepared to undertake this small-scale work in accordance with our instructions, using our own dyes and avoiding the use of chemicals during the process of dyeing. This proved to be very difficult, although we finally succeeded in finding one prepared to meet our requirements.

Adhesives, paints, lacquers, varnishes Other potentially harmful materials include adhesives, paints, lacquers and varnishes used in showcase construction. Many of these substances can emit damaging vapors, and, therefore should be tested for their effect on the metals of which coins are made before use.

Investigation has shown that: epoxy adhesives cause tarnishing of silver but not of lead; polyvinyl acetate emulsion adhesives should not be used for show-cases where lead will be displayed, and some types of polyvinyl acetate solution adhesives cause corrosion of copper, silver and lead. Additionally, polysulphide adhesives give off harmful hydrogen sulphide, corrosive to silver and copper coins. The decomposition of polyvinyl chloride due to the effect of heating or lighting is accompanied by the evolution of hydrogen chloride (hydrochloric acid). This means that PVC sheets should not be used in contact or in close proximity with coins.

Special care must be taken with adhesives containing ammonia as these are harmful to lead, base silver and especially copper. Some rubbery adhesives fall into this class. Synthetic rubber adhesives are very corrosive to silver but safe for lead. Silicone sealants, the adhesive used for the sealing showcases, produce acetic acid vapors while setting, and this is very corrosive to lead and copper. Also, the oils in air-drying paints evolve formic acid vapors as they become dry and this has harmful effects on lead and copper. Different dyes in paints can produce different effects on metals.

Paints based on lead, evolve hydrogen sulphide which causes the tarnishing of silver. Casein is a common constituent of water paints and this is subject to bacterial action and consequently produces hydrogen sulphide. Additionally, paints, adhesives and cleaning products release a high concentration of volatiles when freshly applied, and these diminish with time (a few days or a few months depending on the nature of the material). For the above reasons, it is important that an adequate period of time is allowed before placing artifacts in the same environment as these high emission materials.

The materials considered to be safe are the following: Polymethyl methacrylate and most acrylics, polystyrene, polyethylene solution but not emulsion.

Rubbers The vulcanized rubber used to seal show cases or to dress floors, and the rubber sheeting used in showcases have been shown to be potentially unsuitable materials because it was found that they evolved sulphur compounds.

Additionally, vapors generated outside the show case may well be harmful to coins. Products containing ammonia and chlorine should be avoided for the cleaning of floors.

Considering all of the above, the following suggestions may be useful:

As a general rule we can say that all materials should be tested for their suitability prior to use. Methods of testing display materials have been published by Oddy, Blackshaw, Daniels and Ward of the British Museum. A test which is easy to utilize has been described by Oddy (1973) and it has been extensively used in museums by conservators.

Further, during the designing and mounting of a new exhibition and showcases it is essential that safe materials are used. These include: perspex, polyethylene sheet, acid-free paper, glass and metals, although the latter should not be in direct contact with coins so as to avoid the possibility of electrochemical contact.

Recently, specialized companies have been established which deal with the design and manufacture of museum show-cases and display equipment. These firms have been successful in solving conservation problems.

Serious problems arise in old show-cases, where most of the unsuitable materials mentioned above have been used extensively.

In order to minimize the effect of volatiles present, the following suggestions can be used to improve conditions to an extent:

Ensure sufficient ventilation in the display cabinet. A simple way to do this is the opening of holes in the sides.

The use of scavengers: Scavengers can be used as a stop-gap measure to control harmful emissions from materials. These include: silver wool which may be placed over the holes of the show-case and which has the property to absorb hydrogen sulphide and pellets of activated charcoal which absorb harmful vapors. Bags and wraps of tarprufe impregnated cloths have been utilized successfully for the protection of coins in storage. These fabrics are very effective when they surround an object as is possible in storage. Unfortunately, however, it is obvious that they cannot be used on display as the exhibit cannot be wrapped.

Another method is the application of vapor barriers to material surfaces. If there is a possibility that noxious compounds may be transferred by contact, an impermeable barrier may be used. The properties of a good isolation material include high stability and high impermeability. One of the best vapor barriers is a sheet of plastic laminated aluminum available under the trade name of Marvelseal or Marvelguard. This vapor barrier sheet is applied to the material surface with a hot iron. The polyethylene layer then melts and acts as an adhesive. The plastic laminated aluminum is an excellent vapor barrier if applied correctly.

It is generally recognized that the application of protective coatings (lacquers) directly to the artifacts to block the effects of volatiles does not give adequate protection against organic acids or hydrogen sulphite.

Control by reduction of relative humidity: Low relative humidity can decrease the speed of the degradation process. For example, the tarnishing of silver is strongly affected by moisture. For a display case, the control of relative humidity is relatively simple and can be achieved with low cost technology (desiccants substances such as silica gel or a dehumidifier connected with the show-case). Special attention must also be given to light sources that generate an unnecessary amount of heat inside showcases. Chemical reactions usually proceed faster in higher temperature. Elevated temperature inside a display case should be avoided by ensuring that light sources are located outside, by controlling light levels, by using absorbing filters or by using cool light sources such as metal halide lamps or fibre optics. Care must also be taken to control atmospheric pollutants.

Finally, as a general rule, frequent inspection of the coins on display will allow problems to be discovered early.

In the old show-cases of the Numismatic Museum of Athens, apart from small-scale problems, coins were in a good state of preservation probably because we succeeded in minimizing relative humidity levels inside the

display cases by using silica gel. Perforated fire-resistant glass tubes, filled with silica gel, were placed on the sides of the display cases, in non-conspicuous places.

In the new museum (Schliemann's house) we had the opportunity to design and mount the exhibition. Since the building is of historic value, with wall-paintings and mosaics, it was necessary to design display cases which would complement the setting in which they would be placed. In order to achieve this, we organized a public competition with given specifications for the control of a proper environment for the display of coins. We accepted the company which proposed the best ideas.

In spite of the many references in the conservation literature, the importance of using only stable exhibition materials has not always been appreciated. We hope that it is gradually becoming clearer that some materials must be avoided. We are sure that conservators and curators are now aware of the problems and that they can view the displays in a new light.

REFERENCES

WERNER A.E. Conservation and Display: Environmental Control in Museum Journal, 72 No 2 1972, pp. 58-60

ODDY, W.A., An unsuspected danger in display, in Museum Journal, 73 1973, pp. 27-28.

ODDY, W.A., The Corrosion of Metals on Display in Conservation Archaeology and the Applied Arts, IIC, London 1975 pp. 235-237.

BLACKSHAW, S.M. and DANIELS V.D., Selecting Safe Materials for Use in the Display and Storage of Antiquities, ICOM Committee for Conservation, 5th Triennial Meeting, Zagreb, 1978, pp. 1-9.

THOMSON, G., The Museum Environment. Conservation in the Arts, Archaeology and Architecture, Butterworths, London, 1978.

DANIELS, V D and WARD, S., A rapid test for the detection of substances which will tarnish silver, in Studies in conservation, 27 1982, pp58-60.

BLACKSHAW S. DANIELS V. The testing of materials for use in storage and display in museums in The Conservator vol. 3 1979, pp. 16-19

BLACKSHAW S.M., The Testing of display materials in Museum Ethnographers' group Oc. paper No. 1 Conservation. March 1982, pp. 40-45

ORGAN, R.M. and RAMER B. Some hard truths in Museum 146 1985, pp. 68-70

PETROU-LYKIARDOPOULOU, M., Coping with the Problem of the Decay of Byzantine Lead Seals in the Numismatic Museum of Athens in Recent

Advances in the Conservation and Analysis of Artifacts. Jubilee Conservation Conference. Institute of Archaeology 1987, pp. 165-167

LYKIARDOPOULOU - PETROU, M., Storage and Display Conditions in the Numismatic Museum of Athens, in: Proceedings of the XIth International Numismatic Congress, 1993.

TETREAULT, J. Display materials: The Good, The Bad and The Ugly in Exhibitions and Conservation. The Scottish society for Conservation and Restoration. Pre - prints of the Conference held in Edinburgh 21-22, April 1994, pp. 79-87.

TOPP, A., Designing for Conservation in Exhibitions and Conservation. The Scottish society for Conservation and Restoration. Pre - prints of the Conference held in Edinburgh 21-22, April 1994, pp.13-26

CHAPLIN, E., The Development of a Modern Museum Showcase system in Exhibitions and Conservation. The Scottish society for Conservation and Restoration. Pre - prints of the Conference held in Edinburgh 21-22, April 1994, pp. 63-71.

CARLSON, J. Preparations for the Neb in Exhibitions and Conservation. The Scottish society for Conservation and Restoration. Pre - prints of the Conference held in Edinburgh 21-22, April 1994, pp.97-112.

GREEN L.R., THICKETT, Testing Materials for use in the Storage and Display of Antiquities. A Revised Methodology, in Studies in Conservation 40, 3, August 1995, pp. 145-152.