The Role of Conservation in Display

By
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The conservation requirements of a work of art or artefact must not cease once it has left the conservation laboratory. It must be sorted or displayed in the correct environment, with careful considerations being given to preventive conservation measures, otherwise the object may continue to deteriorate. This is obviously highly undesirable, and in addition, is a waste of time and often money (for contract work) with regard to the conservation work carried out previously.

Planning a Display

When displays are being designed and planned, it is usual for a planning committee to be established involving curators, display officers and education officers, or their equivalent for small museums. The committee should include a conservator to advise on the various aspects of the role of conservation in display as discussed in the following sections. The conservator will have an important input regarding the design and materials of construction of display cases, the environment of displays and also the conservation requirements for objects intended for display. This latter aspect is an essential part of display planning.

Objects for display must be selected as soon as possible so that priorities for conservation can be determined. If sufficient time is not allowed, a conservator may well judge that a certain item cannot go on display as there is no time to conserve it. Too often a conservator is asked to carry out cosmetic treatment only, due to this lack of preplanning. Cosmetic conservation is always full of problems particularly when objects are left on display for a long time, and this should be avoided if at all possible. It is also unlikely, due to pressures of work, that when removed from display the object is given the full conservation treatment it requires.

The conservator may recommend that certain items, due to their fragile condition and advanced state of deterioration, should never be displayed. Although sometimes annoying to the display committee, this advice must be followed – the objects come first. The value of conservation advice at the early planning stage will become more apparent in the following sections.

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Display Case

The display case can be a picture frame, table top case, large upright case or even a room. The aim of the case is to provide an aesthetic surround to the object on display but at the same time to protect it from vandals, theft, insects, mould and adverse environment. The case therefore plays an important role in the preservation of the work of art or artefact.

When considering the construction of a suitable display case, one must first decide whether environmental control is needed. If the museum or gallery is fully airconditioned to the recognised international standards of 20± 2°C, 50± 3% relative humidity (Thomson, 1978), then the demands on the display case will not be as stringent as those for a non-airconditioned building. In the latter case, and where objects need to be displayed in a special environment, the design and construction of the display case must be such that the internal macro environment is controlled.

Before a decision is made, however, concerning the necessity for air-conditioning a museum, gallery, display case etc., it is first necessary to monitor the environment. The levels, and in particular fluctuations of temperature and relative humidity, may not be as bad as expected. This applies in particular to large old buildings, often used for museums, where thick walls and high ceilings will stabilise conditions. Remember, if you do install airconditioning, that the system must be well designed and be the best possible and that it will also be expensive to install and run. Some museums and

galleries have poorly designed and cheap systems; these often cause more problems than a non-air-conditioned building.

Air-Tight Display Case. If the display case is made air-tight, then, it is relatively simple to control the macro environment. In addition, the seals will prevent the entrance of insects etc. However, although relatively simple in theory, it is difficult to obtain perfect air-tight seals in show cases (Padfield, 1967). The typical glass/plastic/metal/wood constructions are often difficult to seal, and they are expensive to construct. In addition, it makes access to the case for changing displays very difficult. For these reasons air tight display cases are only constructed for special purposes. An example where they have been used is for the display of the *Vlamingh* Plate, a pewter plate left on the coast of Western Australia in 1697 and now on display at the Fremantle Museum in Western Australia. Because of the importance of this relic and the susceptibility of pewter to organic acid vapours, the plate is displayed in a sealed stainless steel container with a shatter and heat resistant glass cover In addition, through special valves, the air is flushed out and replaced with an inert gas such as nitrogen or argon which then acts as the display environment. In the Museum of Mankind, Burlington Gardens, London, some ethnographic objects which are particularly humidity sensitive are displayed in sealed cases, each of which having its own air-conditioning unit. This the ultimate in environmental control of display cases, but is also very expensive.

The relative humidity inside a sealed display case can also be controlled using conditioned silica gel, discussed further. It has been calculated (Thomson 1978), that 20kg of silica gel per cubic metre of display case are required to achieve satisfactory control. However the relative humidity has to be closely monitored; if changes occur, the silica gel will need to be taken out and reconditioned.

Ventilated Display Case. Probably the best display case is one that is ventilated when air will move slowly through the case as atmospheric pressure and temperature change. One 5 cm diameter hole for every 1 m^3 of display case (Padfield, 1967) is recommended since this will provide approximately five air changes per year

...the best display case is ventilated...

Control of Display Case Environment

Dust and Pollution. If the case is already airconditioned, then there is no real necessity to provide special filters over the air inlet holes. If the air is not conditioned, then, the display must be sealed as well as possible, with a number of air entry holes provided. Filters should be placed over these holes to remove dust, air pollutants and to prevent entrance of insects. An insect screen would obviously be required even when other air filters are not necessary. The types of filters that can be used are fibreglass filters for the removal of dust, and activated carbon filters for air pollutants (e.g. 500gm of carbon per m^3 of display case).

Temperature and Relative Humidity. The recommended temperature and relative humidity ranges for the preservation of collections is 20± 2°C and 50± 3% relative humidity (Thomson, 1978). The relative humidity must not be allowed to fall below 45% as it will cause desiccation of objects, or rise above 65%RH as this is ideal for the propagation of moulds. In humid climate countries, it is normal to have higher levels, i.e. 22± 2°C and 60± 3% RH, as these conditions are not as expensive to achieve by airconditioning. In addition, the objects within the museum or gallery are likely to come from high temperature and relative humidity environment, and these objects are less likely to get damaged when exposed to the controlled environment.

It is not possible to control the temperature of air without airconditioning facilities. Therefore, any temperature changes outside the display case (or inside from lights, etc.) will be transmitted to the air inside the case by thermal conduction. In an enclosed space, which will contain a certain quantity of water vapour, an increase in temperature will cause a decrease in relative humidity, and vice versa. For example, consider a display case containing 9 gm/m^3 of water in the form of vapour. At 20°C this will produce a relative humidity of 53% which is acceptable for display. However, if the temperature rises to 25°C, the relative himidity will fall to 39% which is too low for many materials causing desiccation. A drop in the temperature to 15°C will increase to 70%, the relative humidity which is above the mould growth level. On the other hand, if the temperature drops below 10°C, the saturation point will be reached and water will begin condensing out causing serious problems.

Even without airconditioning facilities, it is possible to control these fluctuations in relative humidity. Moisture absorbing

materials can be used in the construction of the display case. These include unvarnished wood, parchment, paper, cotton, silk, hessian, wool cloth and felted wool. When the relative humidity rises, these materials will absorb moisture and when the relative humidity drops, the materials will release moisture, in this way smoothing out the fluctuations in relative humidity. For example, in the m^3 of display case we are considering, the presence of I kg of cotton will reduce the fluctuations in relative humidity by a factor of five times.

An alternative to absorbing materials are those adsorbents such as silica gel which act by a different chemical/physical process known as adsorption. Silica gel is well known as a desiccant or drying agent, and with the addition of an indicator will change colour from blue to pink by the adsorption of water At this stage, it must be dried in an oven to drive off the water. When the colour reverts back to blue, the silica gel can be reused. In addition to this use as a desiccant, silica gel can be preconditioned by holding it at a given relative humidity, say 50% for five days. If this is then placed in the display case it will, by a similar process as the other materials, remove and release moisture with changes in relative humidity, smoothing out the fluctuations.

If it is important that the environment inside a display case be stable, the levels of temperature and relative humidity will have to be recorded. This can be done with the aid of a dial hygrometer and dial thermometer, or for relative humidity alone, of paper humidity indicators which change colour with the variation in relative humidity.

Lighting. The standards for lighting of museum displays have been well established (Thomson, 1978). For very light sensitive material such as textiles and paper, the illumination should not exceed 50 lux and the ultraviolet radiation 30 u watt/lumen (1500 u watt/m^2), and for reasonably light sensitive materials, the levels not to be exceeded are 150 lux and 80 u watt/lumen (1200 u watt/m^2) respectively. The illumination can be measured with a luxmeter or light meter (e.g. Gossan 'Panlux' light meter), and the ultraviolet level with a UV meter (e.g. UV Light Monitor Type 760).

Never place objects in direct sunlight.

Ultraviolet radiation is a component of sunlight and it is the most damaging, having a shorter wavelength than visible light. The other component of sunlight to be considered is infrared which, with a longer wavelength than visible light, is not as damaging but does produce heat which must be accounted for in the display design.

In display cases, there are a number of ways of achieving the recommended light levels. First, as much ultraviolet radiation as possible must be removed by the following methods:

i. Never place objects in direct sunlight. In addition to the damaging effects of the light, the increase in temperature when the sunlight falls on the object will cause the problems discussed previously.

ii. Window glass will remove only a little of the ultraviolet light and a large proportion will still fall on the object. This can be removed by a variety of filters such as:
   a) clear UV absorbing films for protecting windows,
   b) thin plastic sheet coated with vapourised metal which acts as a heat and light reflector, however, also causes colour rendition problems,
   c) clear UV absorbing varnishes,
   d) laminated glass containing a UV filter,
   e) UV absorbing perspex (trade name)

From experience the most useful filters are the thin UV absorbing film and the UV absorbing perspex. A suitable UV absorbing film is that produced by the 3M Company, known as P70. In addition to filtering out the UV, it also has excellent glass retaining properties in the case of a blow or shock being imparted to the glass. A similar product in the Madico range is the colourless transparent film FSW 100C1 (Clarke, 1980). Care must be taken with the coated films which although reducing light and heat levels are often not good UV absorbers.

Ultraviolet absorbing perspex (e.g. Plexiglas 201 from Rohm and Haas or Perspex VA from ICI) is a well used technique for controlling ultraviolet radiation. It can be used as a replacement for glass in display cases or in picture frames, placed in front of flourescent lights, or used to cover individual light sensitive items.

jii: Display cases are usually illuminated by either fluorescent lights or incandescent lights. Whichever system is used, it is better if the lights are positioned outside the case although this can cause reflection problems. If they are incorporated into the design of the case, either at the side or overhead, the case must be well ventilated to allow any heat generated to escape.

If fluorescent lights are used (much cooler in temperature than incandescent lights), then

Reduce illumination levels by using no direct natural light, only controlled artificial light.

special low UV output bulbs, such as Philips 47-37 or 27, are available (the number indicates colour temperatures of 5,000, 4,200 and 2,700 K respectively). Normal fluorescent lights produce too much ultraviolet radiation. These low UV output tubes cost approximately twice that of normal bulbs.

Incandescent light emit an acceptable low level of ultraviolet radiation, however, they produce a lot of heat which must be dissipated. A type of incandescent lamp known as "Cool Beam" with a built-in reflector is preferable as it directs the heat from the lamp backwards away from the art work.

iv. Levels of ultraviolet can be lowered by designing an illumination system such that the light falling on the object is reflected light only. If the light is reflected from a wall or board coated with white titanium dioxide paint, then the amount of UV reflected is only 10-20% of that incident to it.

A word of warning concerning maintenance of lighting systems. Where special low UV output fluorescent tubes or "Cool Beam" incandescent lamps are used, for example, care must be taken that when they breakdown they are replaced by the same lamp. It may be advisable to have all the fluorescent tubes in the Museum of the same low UV output type to avoid mistakes being made which will cause damage to the objects on display.

Care must also be taken with the use of commercial products that claim special UV absorbing properties. Test these before use. They may not be as effective as they are claimed to be. Contact the Regional Conservation Centre, Canberra if necessary for assistance.

Having controlled the ultraviolet component of light, the conservator should control the illumination (lux) next. Remember that the effect of illumination is accumulative. The amount of damaging exposure received by an object is equal to the total radiation it receives multiplied by the length of exposure, i.e. if the radiation level is doubled, the same amount of damage will be caused in half the time. It is necessary to reduce illumination levels to 150 lux or less for the majority of objects on display except those such as stone, ceramic, glass or metal. The illumination levels can be reduced in the following ways:

i. Use no direct natural light, only controlled artificial light, preferably diffused or reflected.
ii. Time switches on lights or the use of curtains can reduce the time exposure of light sensitive materials to the minimum.
iii. Alternating material between display and storage (where it should be stored in the dark) will also help to reduce exposure times.

Often a conservator will recommend that a certain item can only be displayed for a given short period of time as further display may cause damage. This recommendation must be followed.

Some of these recommendations are expensive to implement; however others, particularly the correct positioning of displays and the use of curtains, are relatively inexpensive.

Where special illumination levels are required in a display gallery, consideration must be given to the layout of the displays. It is bad to enter a dark room from a well lit area as the eye cannot adjust quickly. Ideally, the public should be directed through rooms or galleries which have progressively lower illumination levels. A display illuminated by 50 lux can be quite acceptable.

Insects. Insects must be kept away from display cases as they can cause a lot of damage. We have all seen examples of this in display labels eaten by silverfish and the not so apparent damage by other insects to organic materials on display. The best method of control is one of preventive conservation, incorporating both a routine inspection of the display plus the regular application of an insecticide. There is no 'safe' insecticide available that has a residual effect for more than approximately three months when the insecticide must be replenished.

There are several ways of applying the insecticide but in no case should it be applied directly to the object on display. We do not have sufficient knowledge about the long term breakdown products of insecticides, and damage may be caused by the accumulative effect of repeated applications over a period of time.

i. Insecticides that should not be used include: Aldrin, B.H.C.

Mould growth will be no problem provided that relative humidity within a display case is kept below 65%.

(Gammexane and Lindane), Carbon Disulphide, Carbon Tetrachloride, D.D.I., Dieldrin, Ethylene Dichloride and Hydrogen Cyanide. Another, Paradichlorobenzene must not be used for ethnographic materials or any other objects where resins or gums are present, as these will be softened by the insecticide. Dichlorvos, or DDVP strips (Trade-names — Nuvan, Shelltox, Vapona, Flicktrax), a popular form of insecticide, should also not be used with cultural collections. They release acidic vapours, expecially in high relative humidities as found in South-East Asia, which will damage the material.

ii. Naphthalene, in the form of flakes or mothballs, has been used as an insect deterrent for many years. It will normally not kill insects, but rather will keep them away due to the smell produced by the Naphthalene. If used, the flakes or mothballs must not be allowed to come into contact with the object.

iii. Fumigation with methyl bromide or ethylene oxide (diluted with carbon dioxide) is used by some organisations but special fumigation chambers are required for this. It is an expensive but effective way of killing all insects present; however, the gases have no residual effect and an insect could enter the collection only a few days after fumigation. In most countries, commercial or government facilities are available for fumigating collections.

iv. The method preferred is the isolation system. A suitable insecticide is applied around the base or exterior of the display case to stop the entrance of all crawling insects, and also, to prevent insects escaping from an infected display case. Although insects could enter by flying, the construction of the display case would tend to prevent this and the majority would therefore enter by crawling. A recommended insecticide is one of the carbamates, such as Ficam or Multamat (Fisons), or Permethryn 25/75 (Coopex). These are contact poisons and can be applied as a wettable powder. They have a residual life of approximately three months.

Mould. Provided that the relative humidity within a display case is kept below 65%, there should be no problems with mould growth, as the spores require a relative humidity higher than this for propagation. This is another reason for making every effort to control the relative humidity inside a display case, particularly as high relative humidities prevail in tropical and sub-tropical countries, and the usual means of reducing mould growth by keeping the air moving with fans etc., obviously cannot be used within a display case.

Materials of Construction. Often a curator or conservator does not have much choice as regards the materials of construction of a display case; however, the wrong materials can cause damage to objects on display.

A number of showcase materials have been tested and the following problems have been observed (Oddy 1975, Hutchison 1977, Padfield et.al. 1982).

i. Polyvinyl acetate emulsions, which are the basis of many wood glues, cause severe corrosion of lead or pewter objects, they can also tarnish copper and silver Adhesives containing ammonia can cause tarnishing of lead, silver and particularly copper, brass and bronze.

ii. Plastic dust excluders and edging strips can give off harmful vapours, such as sulphur, which will cause tarnishing of metals.

iii. Paints must be allowed to cure and dry out well before display cases are used.

iv. Some fabrics give off harmful vapours usually produced by the dyeing agent. Also dyes must be fast because if there is a high humidity problem within the case, colours may run. Beware of fire-proofing agents, these can also release harmful vapours.

v. Some woods, particularly chipboard, give off harmful vapours such as formaldehyde. This can easily be detected in a new case by the strong, sharp odour produced. Woods tested at the Conservation Department of the Western Australia Museum (Hutchison, 1977) showed that phenolic resins were present in large quantities in oregon pine, ramin ply, marine ply, meranti and jarrah in decreasing order Formaldehyde gas was present in veneered chipboard and ramin ply. The application of paint

films is not always sufficient to prevent the slow release of harmful vapours.

If chipboards have to be used because of economics, then they should either be formaldehyde free (difficult to obtain) or treated with a solution of urea in water (a mixture of 50 gm of urea to 75ml of water brushed on to each m^2 of wood surface, Zenichi, 1975). This is another point in favour of the ventilated display case which would allow the escape of any harmful vapours.

The important thing here is TEST ALL MATERIALS BEFORE USE. You should determine what woods, fabrics, adhesives etc., are to be used for constructing the display case and these must be tested before use. Oddy (1975) recommends heating the material under test with samples of polished metal (copper, silver etc.) in a humidified atmosphere at 60°C in an oven. If tarnishing is to occur, it will happen within a few hours. The material is considered safe if there is no tarnishing after 28 days.

Support Materials. In order to support objects, either flat or three dimensional, in a display case, the correct support materials should be used. The following which should NEVER be used include drawing pins, nails, staples, adhesive tapes. These are all likely to cause damage to the object, with pins and nails rusting and adhesives becoming very difficult to remove with time. If pins have to be used then they must be stainless steel (e.g. insect pins). Textiles can be pinned or sewn to a backing fabric (tested beforehand) that can then be attached to the display case. In a similar way, costumes can be attached to a dummy. For large flat textiles, such as tapestries, the use of Velcro is recommended, one half being sewn to the textile and the other glued or tacked to a strip of wood which can be fixed in the display case. Objects that need to be raised for display are best supported on shaped pieces of perspex, attached to the wall of the case. Do not support objects, particularly ceramics and glass, with nylon wire. Under the influence of light, heat and with time, the nylon can deteriorate and might break. Works of art or historic items of paper must be framed and matted correctly. If possible, do not display original photographs. A good copy will be just as effective and there is no danger of damaging the irreplaceable original.

Design and Construction of Displays

It is outside the scope of this paper to discuss the design and methods of construction of display cases. A very useful publication is that by Bertram, 1982.

Outdoor Display

Many objects cannot be displayed in a case but are on open display either indoors or outdoors. These cause particular problems some of which can be overcome by methods used for objects within display cases, however additional problems are as follows:

i. Objects on open display are very susceptible to being touched by the public or furthermore to vandalism, therefore some form of security will be required.
ii. Objects displayed outdoors are susceptible to extreme climatic conditions including heat, water (possibly ice), dirt and dust, air pollution, and bird droppings etc. All of these will cause deterioration of the object at a much faster rate than if it were displayed indoors, and more so again if displayed in a case. The outdoor object must therefore be protected by shelters or by paints systems which will require regular maintenance. If composed of wood or other organic materials, e.g. canvas, they must be treated with insecticides and fungicides — these must not harm anyone touching the object.
iii. Vehicles, in particular horse drawn vehicles, should be supported at the axles to take the weight off the wheels. This will also avoid direct contact of the vehicle with the ground which can be a source of moisture and also access by insects such as termites.

Outdoor objects on display have therefore a continual problem of maintenance (that can be expensive) and security.

Summary

With the emphasis on preventive conservation, it is possible to design display cases or units that will ensure the preservation of the items on display. Consideration must be given to the interior environment of the case, such as the temperature, relative humidity and air pollution, also the control of insects, mould growth and light levels. In addition, all materials of construction should be thoroughly tested before use to assure that they will not cause damage to the objects on display.

As it may be difficult for some organisations to test materials being used for display case construction, advice can be sought from the Regional Conservation Centre in Canberra. In addition, as some of the materials listed in this paper are not available in South-East Asia or the Pacific (this is the reason why a Directory of Suppliers has not been included), the Regional Conservation Centre should be contacted for information and details of suppliers for specific materials.

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Ancient Beads...

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Large stone beads made of jasper, carnelian, and quartz crystal of many shapes are typical of this period and although traded into the Philippines by the Chinese, probably had their origins in South Asia or India. It is likely too that many beads of European origin, such as types with chevron designs, were reaching the Philippines in protohistoric times through the Chinese trade.

The use of beads as necklaces, armlets, and ear pendants in prehistoric times is shown by their recovery on skeletons. At Calatagan, Batangas, three small beads forming a triangle occurring as a repeated pattern were excavated around the waist of the skeleton of a child. These beads were unquestionably sewn on a cloth skirt or *tapis.* Among the Manobo groups in Mindanao, beads are used to embroider clothing, a continuation of pre-Spanish practices. Sequins of shell and metal are also used to embroider cloth by the Manobo, a practice which possibly predates an identical usage of the tiny European trade beads. Extremely large beads are used as spindle whorls among the Kalinga. The Ilongot decorate every conceivable object with beads, even the shell of coconuts used as drinking bowls, if beads are available. Among the Hanunoo of Mindoro, twenty years ago, small red beads with a white core were literally their currency. Attractive pendant necklaces and chokers of small beads are the outstanding decorative item found among the Agta of northeastern Luzon. The great range of geometric designs found in the bead work of contemporary mountain peoples deserves careful study for they represent ancient designs patterns which show relationships with traditional bead work found throughout Southeast Asia. Among many traditional groups in the Philippines, heirloom beads are only used or worn during ritual occasions.

Although seemingly a mute object of trade, beads are intimately linked with cultural developments in the Philippines, as elsewhere, and their study will someday tell a dramatic story of ancient commerce in Asia.