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# Care of Paintings on Ivory, Metal and Glass – Canadian Conservation Institute (CCI) Notes 10/14

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Originally published 1993
Revised 2015

Also available in French.
Également publié en version française.



ISSN 1928-1455

## Introduction

When we think of paintings, we generally think of works painted on canvas, wood panel, hardboard or rigid card. Many other materials, however, have been used as supports for paintings. Three in particular—ivory, metal and glass—will be discussed here. This Note briefly addresses some of the vulnerabilities and general recommendations for paintings on these three support materials.

## Lighting for Paintings

Any amount of light is damaging to a painting that has pigments that fade; therefore, light levels for display should be as low as possible. A level of 50 lux should be enough for most paintings to be clearly visible. In some situations (e.g. viewing paintings with dark areas; older visitors), a higher light level may be required for adequate visibility. Even at low levels, however, light will cause more sensitive colours to fade noticeably over time (i.e. colours can fade in a matter of decades, or sooner if the paint is thin). Intermittent display (shortening the periods of exposure to light) and reducing light levels will slow this fading process. Please refer to CCI Note 10/4 *Environmental and Display Guidelines for Paintings* and Michalski (1990).

## Relative Humidity and Temperature for Paintings

The relative humidity (RH) generally recommended for paintings is a constant level, somewhere between 40 and 60%. Fluctuations in RH, which damage paintings, are to be avoided. Temperature has an effect on RH level in an enclosed space such as a room, a building or a vehicle. Also, temperature that is too low or too high will have a direct effect on the reactions and vulnerabilities of materials in paintings. It is best to keep a steady temperature within the "human comfort" range of 16 to 25°C. The lower temperature is better for slowing down the rate of deterioration, but it will increase the brittleness of paint, making a painting more vulnerable to damage if handled.

Specific recommendations for paintings on ivory, metal and glass, relating to temperature and RH, will be covered under their respective sections in this Note.

**Transporting paintings** can sometimes put the works of art in situations where RH and temperature will fluctuate or become too high or too low. It also involves multiple stages of handling, and a high potential for experiencing shock and vibration. Refer to CCI Note 10/16 *Wrapping a Painting* for information on the **first stage** of protecting paintings against incorrect RH and temperature during transport. Also, refer to the Canadian Conservation Institute (CCI) website for information on shipping (specifically

Six Steps to Safe Shipment). For more information on personal protective equipment for small mould problems or where larger numbers of objects are affected and more specific PPE is required, refer to Technical Bulletin 26 *Mould Prevention and Collection Recovery: Guidelines for Heritage Collections*.

## Paintings on Ivory

Paintings on ivory are generally quite small. They are often called miniatures. However, the term in this context is not referring to size, but comes from the Latin "minium," the red pigment often used in decorating early manuscripts. ("Miniatures" may also refer to paintings on other support materials such as vellum, paper, metal or porcelain.)

Using ivory as a support for painting miniatures was popular in the 18th century and into the 19th, when photography was invented. The paints most commonly used were water-based (watercolour, tempera, gouache or "bodycolour"), applied directly to the ivory. As a paint support for miniatures, ivory was usually made very thin, making it quite translucent. The thin ivory was often attached to a secondary support made of paper or card. For visual effect, the reverse of the translucent ivory was often painted, or a metal foil inserted between the ivory and its paper or card backing. Miniatures were frequently sealed in intricate metal lockets or cases, which often had glass covers or "crystals". Sometimes, a lock of woven hair was included inside the casing.

### Deterioration

Paintings on ivory are very fragile. The thin and delicate paint surface can easily be rubbed off or soiled by mishandling. If the ivory itself is held by the sides, even slight pressure can cause it to bend or split. If held in the palm of the hand, a thin ivory could react to the skin's moisture, which could quickly cause the ivory to warp. Removing an ivory from its case should only be carried out in an emergency situation or by a conservation professional, if treatment is required.

Even a very small amount of water on a painted ivory can affect or obliterate brush strokes and image. Water damage can occur if a person simply speaks over an uncovered ivory; if an enclosing case or frame is improperly cleaned; or if condensation forms on the inside of a case or crystal. Residue from a cleaning compound can contribute to the corrosion of a metal case, which will also stain the ivory.

Ivory is very sensitive to changes in environmental conditions. Ivory supports are very prone to warping and splitting in fluctuating RH. Damage will occur if the natural movement of the ivory in response to changes in RH is restricted, as in a tight-fitting case or frame. The problem is compounded when the ivory has been attached to a secondary support—both the support and the glue used will move with changes in RH. This may result in corrugated buckling or even in dimples in the ivory, depending on whether the ivory is glued to the secondary support across the entire surface or only at selected points. A change in temperature can also result in the damages noted above, due to its effect on changing the RH level.

Organic materials used for (and enclosed with) the paintings can support mould growth. Therefore, avoid high RH conditions, which encourage biological activity and warping of the ivory. If the RH is too low, the ivory can warp and/or crack. Low RH will also make the ivory and paint more brittle, which will also make the painting more susceptible to mechanical damage.

Paint flaking can occur if not enough medium was used in the paint; or if the bond of the paint to the ivory is not strong enough; or if the paint medium cannot withstand (without cracking or separating from the ivory) the natural movements of the ivory in fluctuating RH conditions.

### Recommendations

The RH for a painting on ivory should be kept **constant**, somewhere between 40 and 60%. While it is very difficult to maintain a constant RH in a room, a sealed and airtight display case or a box will reduce RH fluctuations, particularly if the enclosure incorporates a humidity-buffering material such as acid-free card or silica gel (see CCI Technical Bulletin No. 10 *Silica Gel* by R.H. Lafontaine). Storage or display in a cabinet or drawer that contains a relatively large amount of hygroscopic buffering material, such as acid-free blotter or matboard, will provide considerable protection. An enclosure will also help prevent dust from collecting in any cracks in the ivory. Because ivory is easily stained, avoid direct contact with non-colourfast materials or with metals that corrode.

Because paintings on ivory are extremely fragile and require a stable RH, do not allow them to travel without ensuring safe environmental conditions and handling procedures.

Handling these paintings should be kept to a minimum. Restrict handling to one or two people familiar with their fragility. Avoid handling an ivory directly.

Paintings that must be moved and that do not have their own protective cases can be supported temporarily by gently sliding a piece of card under them. They should, however, be more permanently protected by enclosing them in individual, custom-made, acid-free boxes (see CCI Note 11/1 *Making Protective Enclosures for Books and Paper Artifacts*), or in modified "sink" mats (Figure 1). An enclosure must not be so snug that it restricts an ivory's natural movement. Never press on a warped ivory—it will crack.

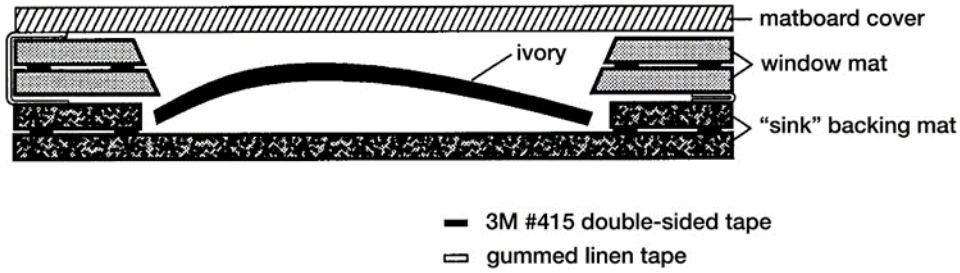



Figure 1. Variation of a sink mat for flat display. This sink mat has three levels. The backing mat is made of a window mat and a back mat, taped together with double-sided tape to form a recess for the ivory. A window mat, made of two pieces of matboard taped together and hinged along one side to the back mat with gummed linen tape, exposes the ivory while gently holding its edges. A matboard cover, hinged to the top of the backing mat and the bottom of the cover with gummed linen tape, can be opened to expose the matted ivory.

Original lockets or cases are integral parts of the objects. Ivories still in their original enclosures should be left intact. Opening the lockets may require specialized expertise to avoid damaging the crystal, locket, or the painted ivory itself.

Refer any treatment of paintings on ivory, including cleaning their enclosing lockets or cases, to a qualified conservator.

## Paintings on Metal

Various metals have been used as supports for paintings throughout the centuries. These include silver, tin leaf, iron with tin on either side, copper, or copper coated with silver, tin, lead, or zinc. Copper seems to have been the most popular metal support.

The metal plates used for painting are thin and are not usually very large. Although painting enamel on copper flourished in the 16th century, oil was generally chosen for painting on metal into the 18th century. Oil grounds were normally used, but artists sometimes painted directly on the copper because of the visual effect its colour created.

### Deterioration

Metal does not expand or contract in response to changes in RH as many other materials do. However, it does corrode, which can cause paint to be stained, to "erupt" or break at corrosion points, and to flake off.

Some paintings on metal are very stable and remain in good condition over long periods of time. However, on others the paint will crack and have adhesion problems that result in flaking. Metal is durable in some respects, but paintings on thin metal often buckle or bend from mishandling or from too-tight framing.

### Recommendations

RH should be kept **constant**, ideally between 40 and 50%. The lower level is better for metal because it lowers the chance of corrosion, but the paint materials will be more brittle and more easily damaged from handling. Because corrosion is a risk with metal, avoid higher levels of RH. Also, inspect paintings regularly for flaking paint and for evidence of corrosion that shows as spots or eruptions in the paint and change in surface texture.

Any attempt to flatten a dented or buckled metal support may cause paint to flake off. Consult a qualified conservator on any such treatment.

Paintings, including those on metal, should not be tight in their frames. Allow adequate room for a support or a wood frame to expand (see CCI Note 10/8 *Framing a Painting*, under the section "Special Cases: Paintings on Rigid Card").

If a painting on metal is not framed, it is easily damaged. Until framed, the painting can be stored face up in a shallow box where it cannot shift, or in a sink mat (see the recommendations for ivory). A simple rigid cover can be made to protect the work from dust.

## Paintings on Glass

Glass has been used as a painting support since the Middle Ages. Although many glass paintings stand as complete works in themselves, others are incorporated into other objects such as clock doors and mirrors.

Unlike most other paint supports, the glass usually forms the front of the painting rather than the back. The paint is applied to the back of the glass, and the finished painting is turned and viewed **through** the glass. These paintings are often referred to as "reverse glass" paintings (also called "back-painted glass").

The traditional media used for painting on glass varied (e.g. watercolour, oil, egg tempera). They were applied either directly to the glass or over a clear preparatory layer of oil, varnish, glue or even a garlic rub. Gold leaf, metal foil and mother-of-pearl are also often incorporated in these paintings. Backings of paper, card or wood were common.

A variation of this type of painting is the “transfer print.” A transfer print was created by using a varnish material to attach a paper print to the back of a piece of glass. The print was thinned by dampening it and then most of the paper was removed, leaving the ink outlines and a very thin layer of paper on the glass. The paper that remained was then painted.

### Deterioration

Glass responds minimally to changes in RH and, therefore, does not contribute greatly to movement in the painting, unlike supports such as canvas and wood. However, because glass is non-porous and slick, the adhesion of paint to glass is generally poor. Therefore, cleavage (separation of the paint from the glass) and flaking on these paintings are very common.

If there is paint cleavage, the appearance of the painting changes. Areas affected by this separation, when seen through the glass, appear lighter in colour than the well-attached paint. These areas are sometimes easier to detect when viewed at an angle rather than straight on.

If a varnish or glue was applied to the glass before painting, the image may be disfigured because the layer has yellowed or darkened.

The fragility of glass also means that cracks and breaks from handling are quite common.

### Recommendations

Maintaining a **constant** RH between 40 and 60% will reduce the movement of the paint and will, therefore, reduce the chances of paint separating from the glass.

Because paint adheres to glass so poorly and glass is fragile, handling and vibration of these paintings should be kept to a minimum. Paint becomes even more brittle as temperatures decrease, so do not handle or transport paintings in cool conditions. Travel for these paintings should be restricted and **very** well controlled.

If paint cleavage is noticed or suspected, the painting should be kept horizontal with the paint side up. As is done for other paintings, fallen flakes of paint should be kept for future re-attachment. If the glass is broken, the pieces should be kept paint side up and should be stored so that they cannot shift or overlap.

If reframing is being considered for a painting on glass (e.g. for travel), remember that the backing layers of these paintings are against the fragile paint side. Attempts to remove backing layers can cause the brittle, poorly adhered paint to crack and flake off. It is best to leave the reframing or other treatment to a qualified professional conservator experienced with paintings on glass.

Proper framing will prevent the glass edges (that may have some unevenness, slight flaws or weaknesses) from touching or moving on any uncushioned part of the frame during handling. Backing materials in the frames of these paintings must also not put any undue pressure on the paint, which can be uneven and very brittle.

## Conclusion

Rigid supports for paintings, such as ivory, metal and glass, have some advantages over more pliable ones such as canvas. They do not flex as easily. As well, metal and glass do not move as much due to RH changes. Each of them, however, has an associated set of problems and weaknesses that must be considered.

As for any work of art, proper framing, controlled environmental conditions and careful, infrequent handling of paintings on ivory, metal or glass will help ensure their survival.

If you have concerns or issues that are not addressed by this Note, please contact CCI.

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