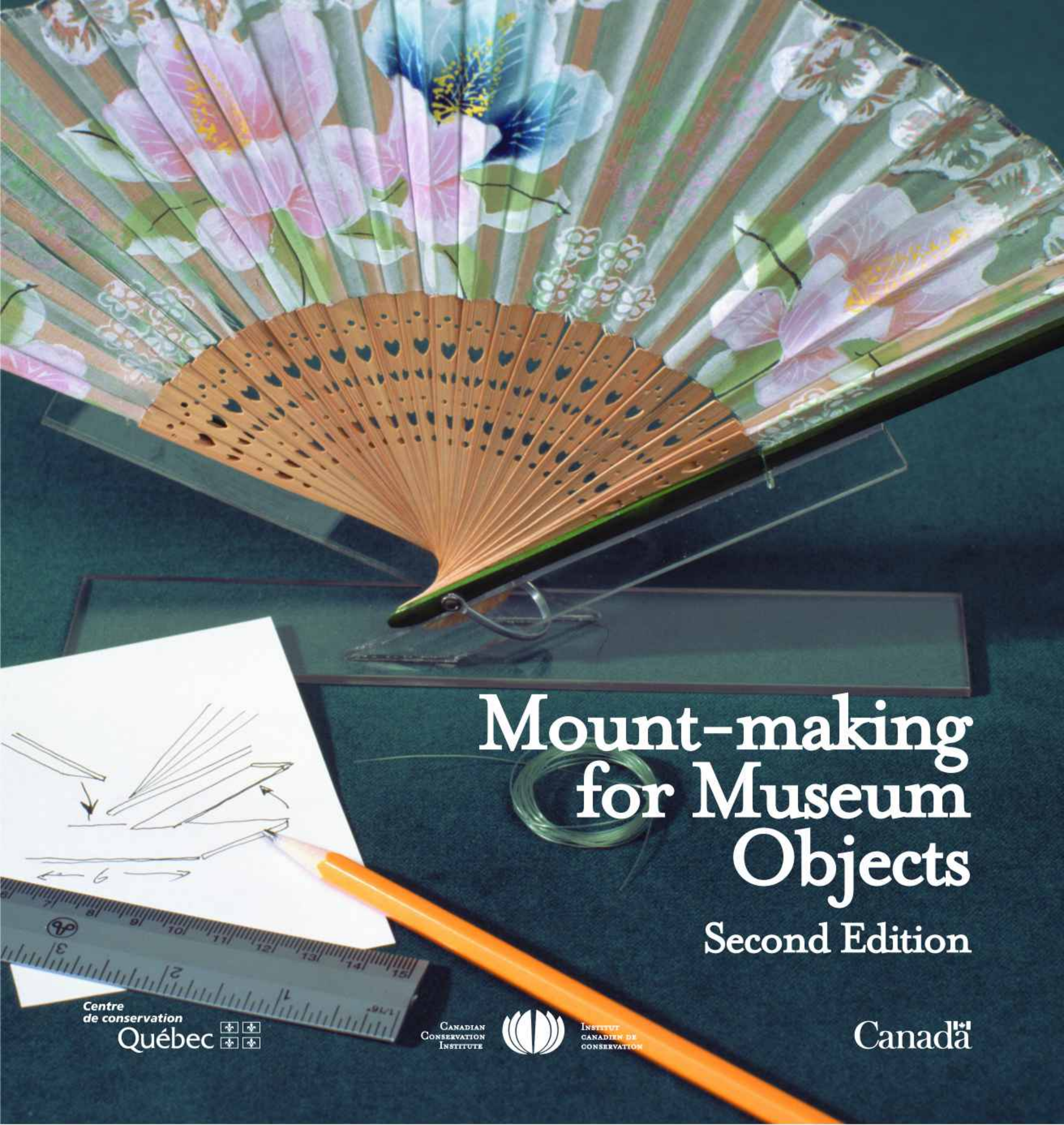

Mount-making for Museum Objects

Second Edition

Centre de conservation Québec

Canadian Conservation Institute
Institut canadien de conservation

Canada

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Second Edition

by Robert Barclay, André Bergeron, and Carole Dignard

with illustrations by Carl Schlichting

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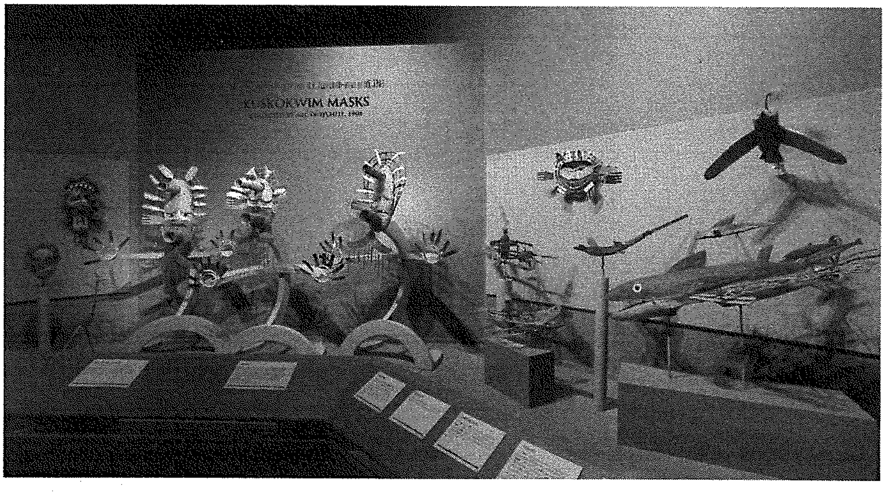

Yup'ik masks. Courtesy, National Museum of the American Indian, Smithsonian Institution. Photo: Katherine Fogden.

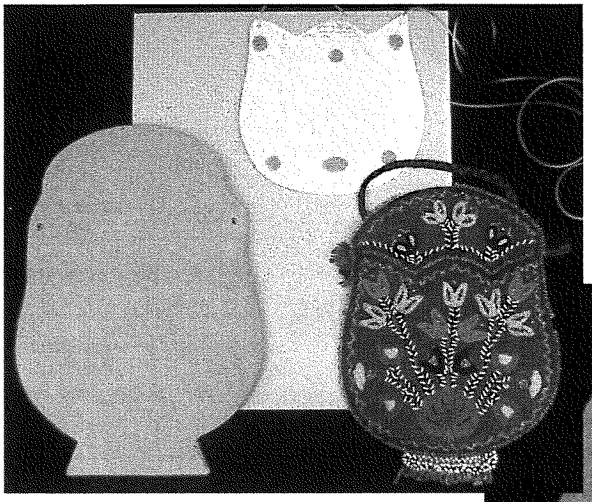

Photo: Canadian Conservation Institute.

Photo: Canadian Conservation Institute.

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Acknowledgements

This book grew out of our workshop experiences in mount-making, together with practical feedback gained from teaching workshops on museum artifact mounting throughout Canada. The latter experience gave us the opportunity to exchange information with technicians, preparators, designers, and other museum professionals, and added to our body of knowledge. We thank all those who have shared their mount-making ideas with us, in particular Patrick Albert, Muriel Dumaine, René Gagnon, Marthe Olivier, France Rémillard, Clayton Smith, and Barbara Spague. We are also indebted to Bradley Froggatt, Dagmar Rais, and Todd Vasalo for reading the manuscript and offering valuable practical suggestions. In addition, the input of various colleagues is greatly appreciated: (from CCI) Jean Tétreault and R. Scott Williams reviewed the chemical composition and stability of mount-making materials, Jeremy Powell and Carl Bigras took photographs, Carl Bigras did digital imaging and image manipulation, Barbara Patterson edited the English text, Linda Leclerc edited the French text, and Sophie Georgiev did the design and layout of the book; (from CCQ) Michel Élie took photographs.

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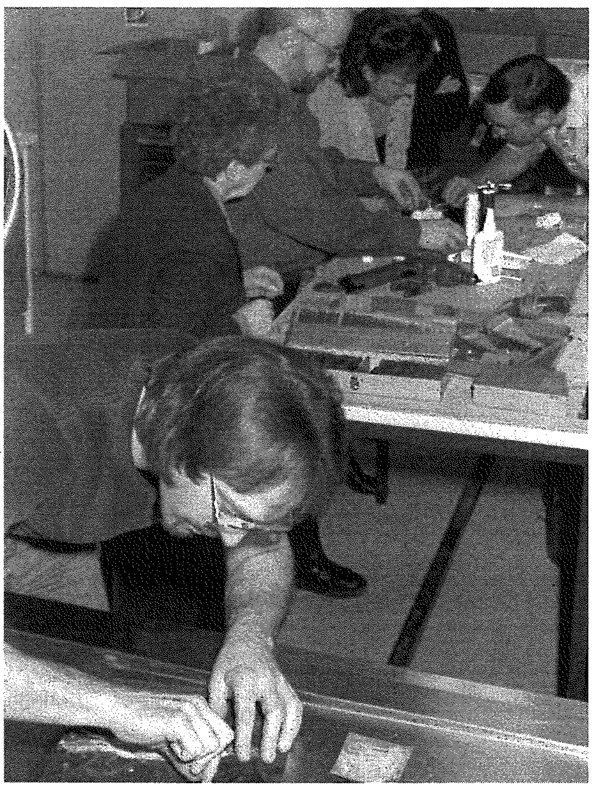

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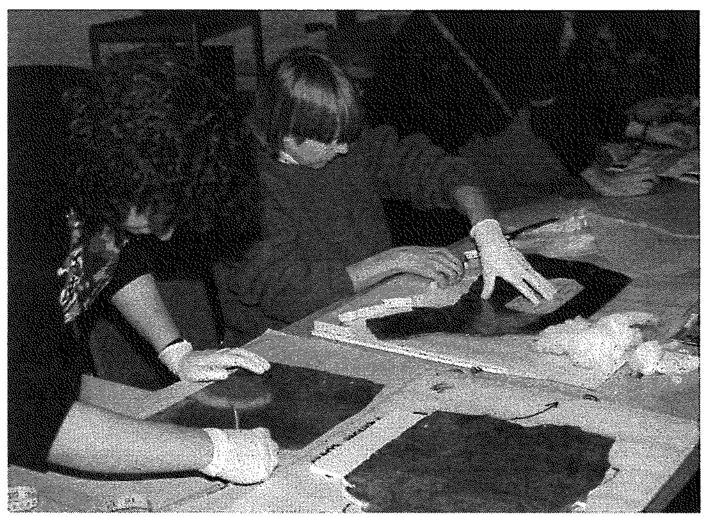


Photo: Canadian Conservation Institute.

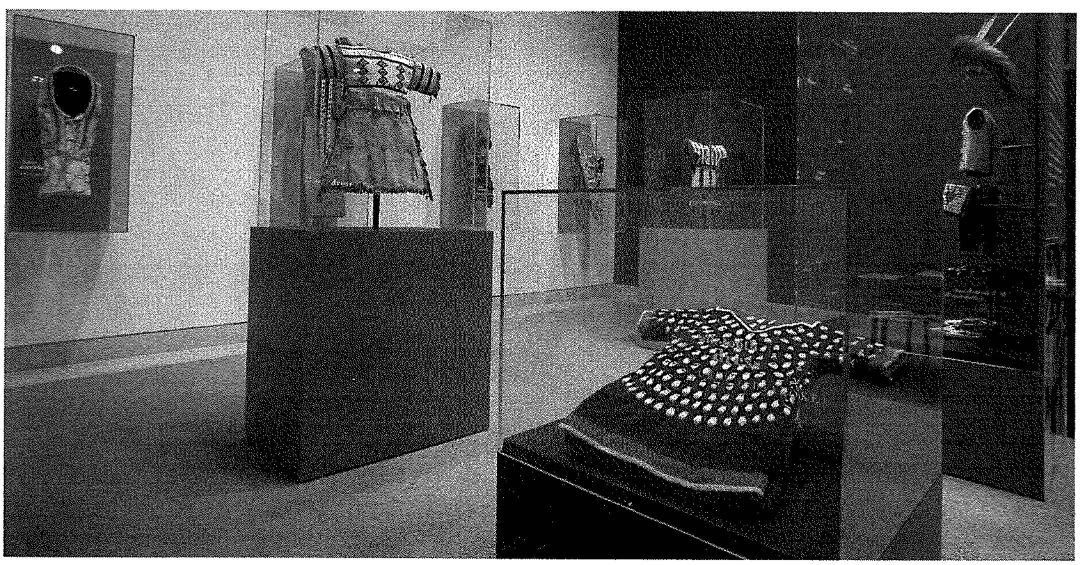
Preface

It is increasingly recognized that prevention of deterioration is far more beneficial than interventive treatment. The choice of materials used in the storage of objects, techniques used in transporting collections, and environmental controls within a building all illustrate the preventive approach. Creating secure and stable mounts plays a key role in the protection of many fragile and flexible objects, and is a further means of preserving collections. Whether such work is directed towards making a padded nest and box for storage, or an aesthetically attractive display mount as described in this book, the ultimate goal is to preserve the object's physical integrity with minimal impact on its structure.

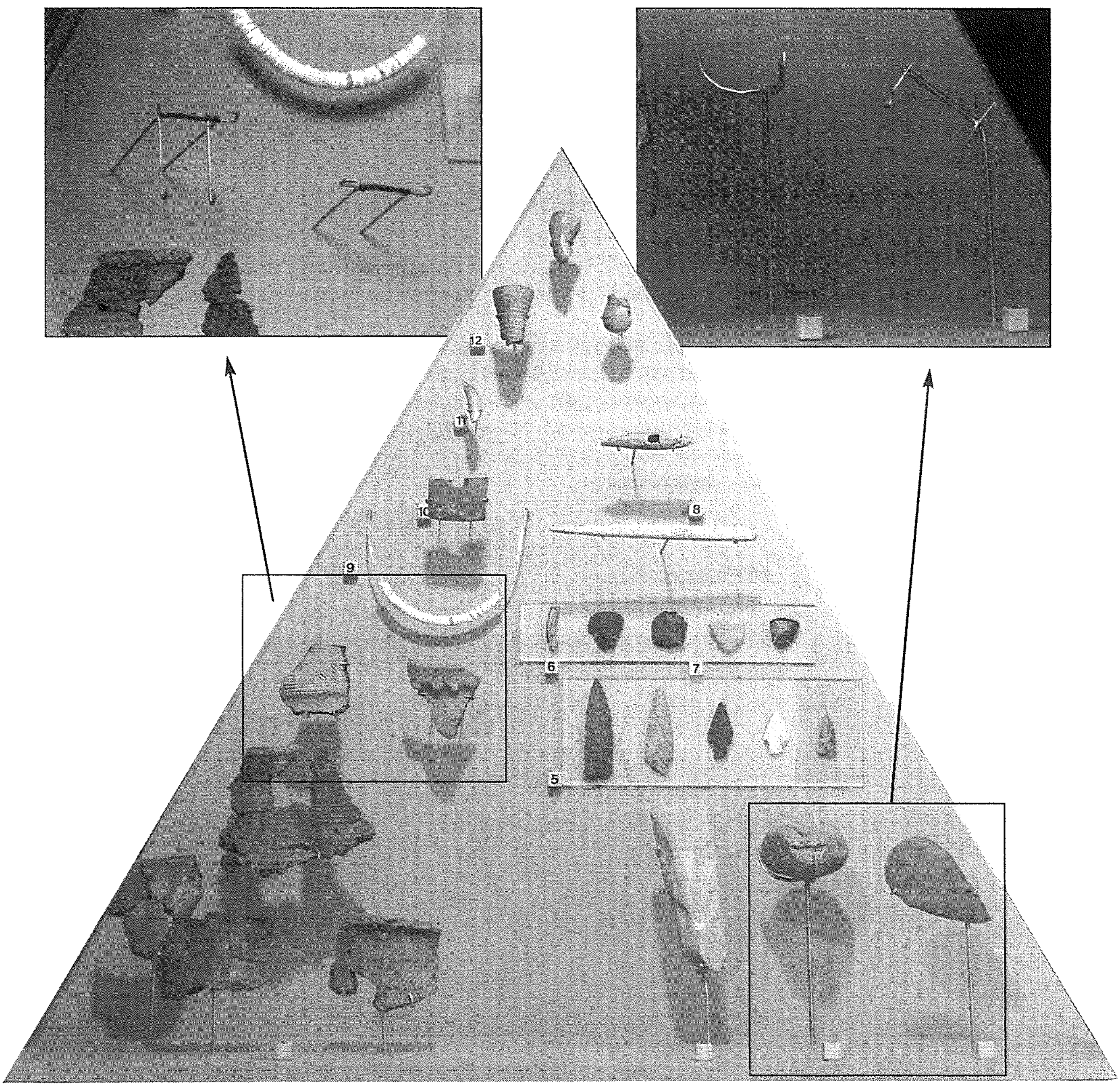
The emphasis on preventive conservation is the result of patient, behind-the-scenes efforts by many conservation professionals who have established working precepts within the museum field. We acknowledge in particular the contribution of Philip Ward whose book, *In Support of Difficult Shapes*, influenced an entire generation of conservators with its novel conceptual and technical approach to all aspects of mount-making.

This second edition (4 years after the book was first printed) has given us an opportunity to bring various changes to the original text: we have updated the content (in particular the "Materials for Mounting Artifacts" section) to reflect current knowledge and information; added the new section "Designing a Mount" and inserted a brief discussion on design with each example presented; included three new examples of mounts; and incorporated more pictures of mount-making ideas and successful mounts throughout the book.
We hope that the readers will find these changes useful.

Robert Barclay
André Bergeron
Carole Dignard



Kiowa and Comanche cradleboards. Courtesy, National Museum of the American Indian, Smithsonian Institution. Photo: David Sundberg.



Archaeological artifacts. Courtesy, Centre d'interprétation de Place Royale.
Photos: Michel Élie, Centre de conservation du Québec.

Introduction and Objectives

This manual addresses the use and construction of display mounts, and is intended for museum workers (e.g. technicians, preparators, exhibit specialists, designers, collection managers, conservators) who have as yet a limited to moderate experience in mount-making. It includes discussions of why mounts are necessary, the materials for their fabrication as well as those that are not recommended for museum use, and how to design them, but the majority of the pages are devoted to fabrication techniques and practical examples. Although neither exhaustive nor definitive, these examples should help readers to broaden their 'creative toolbox' when faced with a new mount-making problem.

As artifact mounting is a practical exercise, those making mounts need to be familiar with the use of basic hand tools; this does not mean they must be hand workers or machinists, but they will want to reserve time to practice using a variety of tools, methods, and materials to gain a minimum basic competence.

Mounts for artifacts on display present special challenges. A good display mount must first be functional, and then as inconspicuous as possible. In other words, the observer's eye should acknowledge the mount but not concentrate on it. Materials should always be chosen for their appropriateness to the job and their unobtrusive appearance. For example, acrylic sheeting is universally used in display applications because of its attractive appearance and excellent working properties, but there is nothing quite so distracting to a small mounted artifact as a crudely finished acrylic base. The nature of acrylic sheeting calls for crisp lines and defined and transparent edges, as the light is reflected and refracted through the material. Wood, on the other hand, is very different in nature and should be treated in such a way that it harmonizes with the object. A fine print framed with a mat that has crookedly cut edges, or a display case with a base covered in creased fabric, are other examples of distracting mounts.

The display mounts in a museum will often be made with the material that is most familiar to the staff member responsible for them. This is fine up to a point, but there are cases where some materials are used in excess whether or not they are the most appropriate for the job. Our goal is to expose the reader to a wide variety of useful materials and potential techniques.

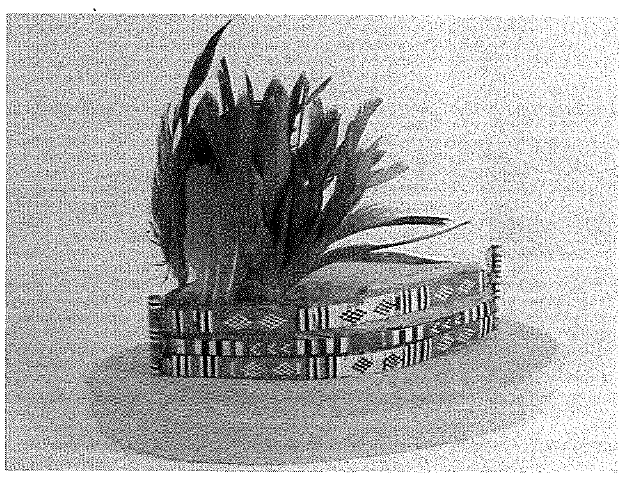
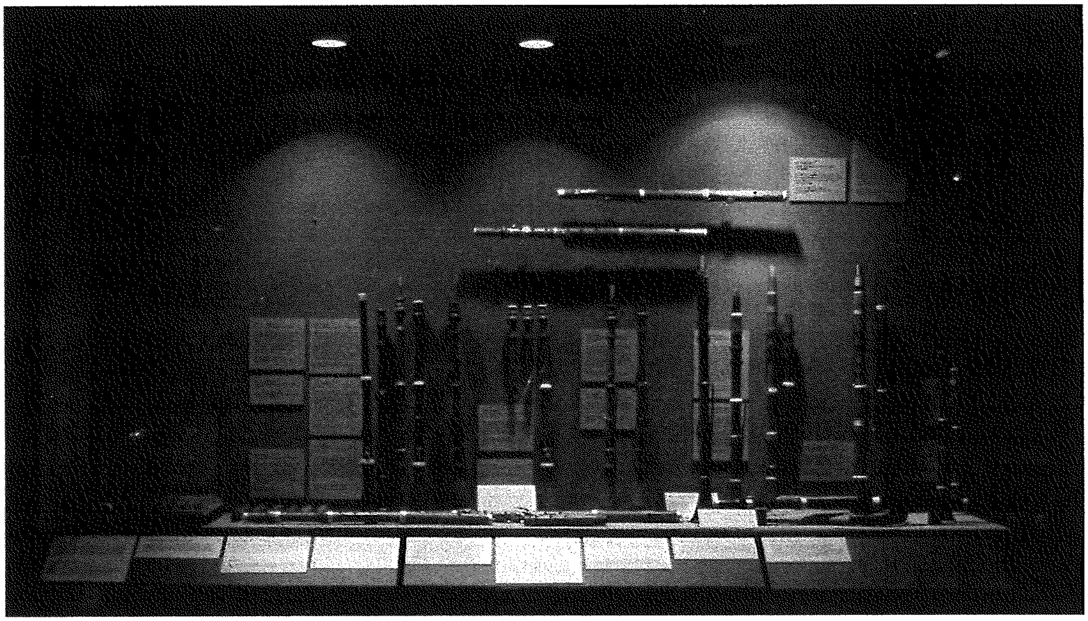
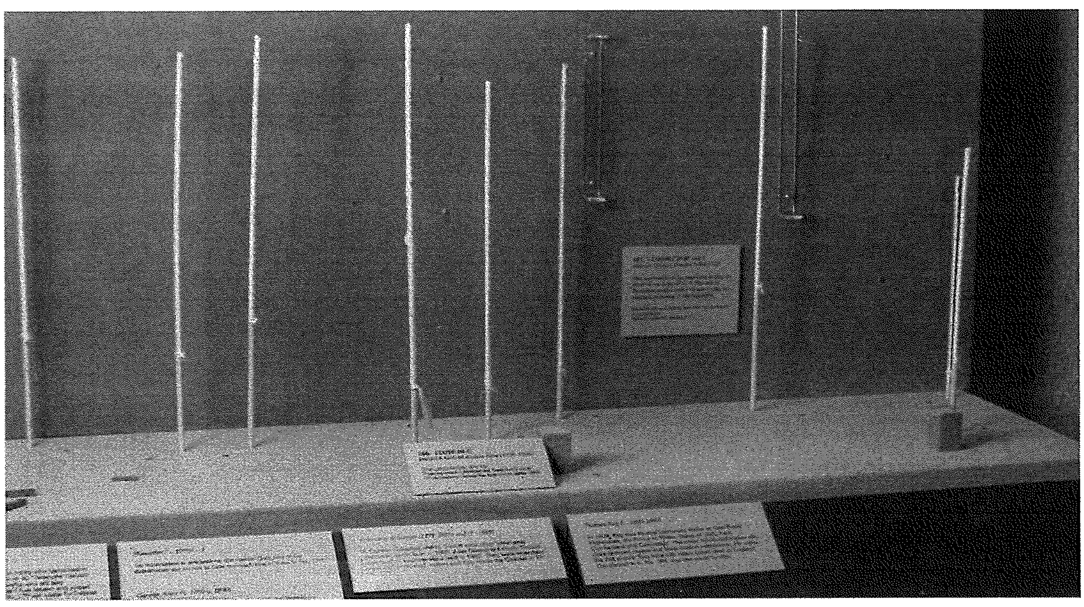


Photo: Canadian Museum of Civilization, image number S88-568.





(Top) Mounted wind instruments on display in the exhibition The Look of Music *at the Vancouver Museum. (Bottom) The mounts alone, made from dowels padded with twill tape. Photos: Vancouver Museum.*

The Importance of Support

The conditions under which an object is handled, displayed, or stored should be aimed at extending its longevity. In many cases it is necessary to create custom mounts or supports for objects that will remain in the same position for extended periods of time.

One problem faced by conservators is convincing people that subtle changes can take place in objects over long periods of time. Changes often occur so slowly that they are not readily perceptible and, to complicate matters, they do not always happen as predicted. For example, it is impossible to predict with certainty that a long wooden object will sag in its centre if supported only at its ends. A solitary exception — a piece of wood that refuses to bend — might be regarded as proof that support theory for museum artifacts is overcautious. However, we have all seen artifacts that have suffered seriously as a result of inadequate support.

A helpful way to understand support is to review the way gravity affects our own bodies: to hold our arms out from our sides, the arm muscles must counteract the force of gravity which is acting to pull the arms down; as these muscles fatigue our arms will start to sag and eventually drop. Although artifacts do not have muscles that tire, they are affected by exactly the same force. The force might be distributed evenly, resulting in minimal pressure, or it can be concentrated on small areas, resulting in excessive stress.

The terms stress and strain are often used interchangeably in normal conversation, but their meanings are actually very different: stress is the force applied to an object whereas strain is the change in shape of the object. For example, the cushion of a chair is under compression stress when a person is sitting on it, and the strain is evident in its change of shape. When the person gets up the stress is removed and the strain is relieved if the elastic limit of the object (high, in the case of the cushion) has not been exceeded. However, if the elastic limit is exceeded permanent deformation will result, i.e. the cushion will remain distorted even after the load has been lifted. In summary, the force of gravity on an object can cause either of the following:

elastic deformation, where the artifact returns to its previous shape if the stress is released (many materials are elastic under very low stresses); or

inelastic deformation, where the artifact does not return to its previous shape on release of stress (the deformation is permanently set).

Creep is a gradual deformation; an object might not show any deformation under stress initially, but with time changes in shape will be noticed. Very slow changes in artifact shapes or dimensions are difficult to detect because we are not accustomed or trained to look for them. Such deformations are permanent.

Museum artifacts may be particularly vulnerable to damage because deterioration over time (e.g. oxidization or cross-linking) can reduce their elastic properties. Paper can become brittle, plastics and rubbers can degrade, and some metals can form stress cracks. Old breaks or weak points in artifacts (e.g. repairs to previous damages, badly designed components, or failed adhesive, solder, welding, stitches, etc.) can also contribute to their fragility. In the case of solder or welds and other deep alterations, the weakness could be invisible and unsuspected. Repaired objects can often be misleading in that they may appear to be strong or sturdy when in fact they are really quite weak.

In summary, objects require support for three reasons:

The object is inherently weak or deteriorated.
The adequate support of museum objects, even if they are light and appear structurally stable, is of great importance (Figure 1). The effects of uneven or poorly distributed supports often become evident only after a long time; structures that appear to be adequate and stable in the short term can prove to have critical drawbacks when viewed over a period of many years. Even internal features of an artifact that appear to be very rigid can change shape in response to new and changing stresses.

The object risks being damaged when handled.
Some objects are too fragile to be handled safely (Figure 2). Flexible objects and those with fragile surfaces or structures, such as flat textiles, heavily decorated skin and leather objects, baskets, etc., are best mounted on rigid supports so that the support, rather than the object, can be handled.

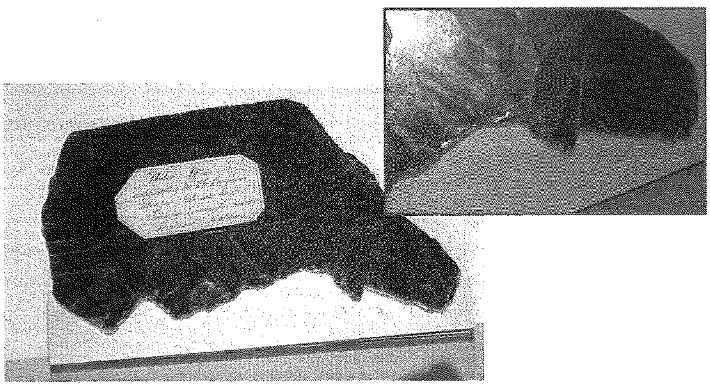


Figure 1. This fragile mica sheet could easily delaminate if not supported along a large area to distribute its weight. The mount consists of a plywood form-fitted base, padded with polyethylene foam. Photos: Canadian Conservation Institute.

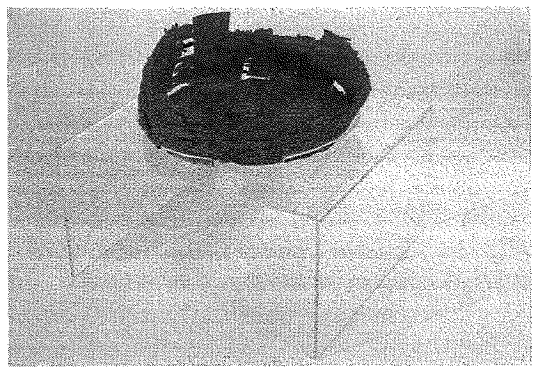


Figure 2. This archaeological basket is extremely fragile and could easily be damaged through handling. It can be protected by using a mount to handle and display it. Photo: Canadian Conservation Institute.

The object needs a mount to be displayed in a certain way.
To display an artifact to best advantage, it must sometimes be supported in an unnatural way, angled toward the viewer or raised above the floor (Figure 3). In such cases, the visual appearance of the mount must be secondary to its primary function, which is to provide support. Compromises between the conservation considerations of adequate support and the aesthetic aspects of pleasing appearance are fairly easy to achieve with the range of materials and techniques available, but the safety of the object should never be jeopardized to achieve a pleasing display design.

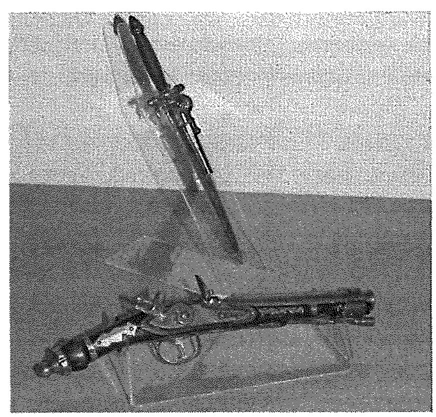


Figure 3. These mounts were designed to display the artifacts in a normal viewing configuration: the knife in a nearly vertical fashion, and the pistol horizontally, slightly raised from the display surface. Photo: Canadian Conservation Institute.

Supports can fail to fulfil their functions for one or more of five reasons:

The points of support are poorly placed.
Points of support must be placed correctly below an object to avoid distortion and damage. An understanding of the object's weak points and the way that gravity acts upon the object is required to place the support appropriately (Figure 4).

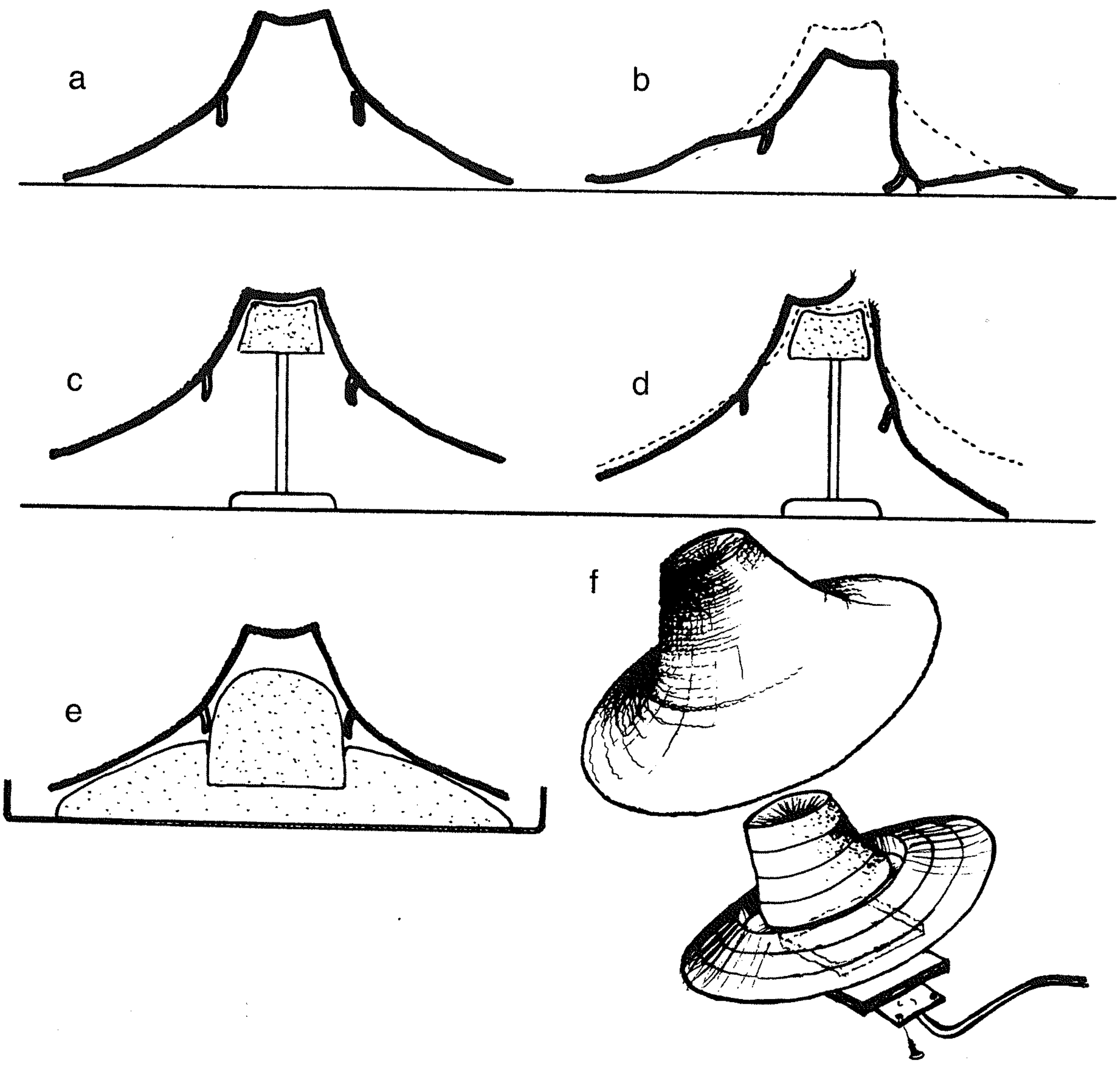


Figure 4. (a) With no mount, this hat is resting on its rim and will eventually suffer damage as shown in (b). (c) With a small upright mount that supports only its top area, damage such as that shown in (d) may eventually occur. (e) This is a much safer mount; it supports the hat over a surface area that is large enough to prevent damage. (f) Another view of the hat and mount; the stem makes it possible to fix the mount onto the wall of a display case.

The object is precariously balanced.
An object must be well balanced on its mount and held firmly. Balance is achieved by taking the object's centre of gravity into account when placing it on a mount. But in addition to the force of gravity pulling downward, sideways shocks from building vibration or contact by visitors can cause artifacts to shift or topple off mounts. Therefore mounts must often include a broad base and clips, retainers, or security lines to hold artifacts securely in place (Figure 5). The prevention of toppling is discussed further under "Designing a Mount."

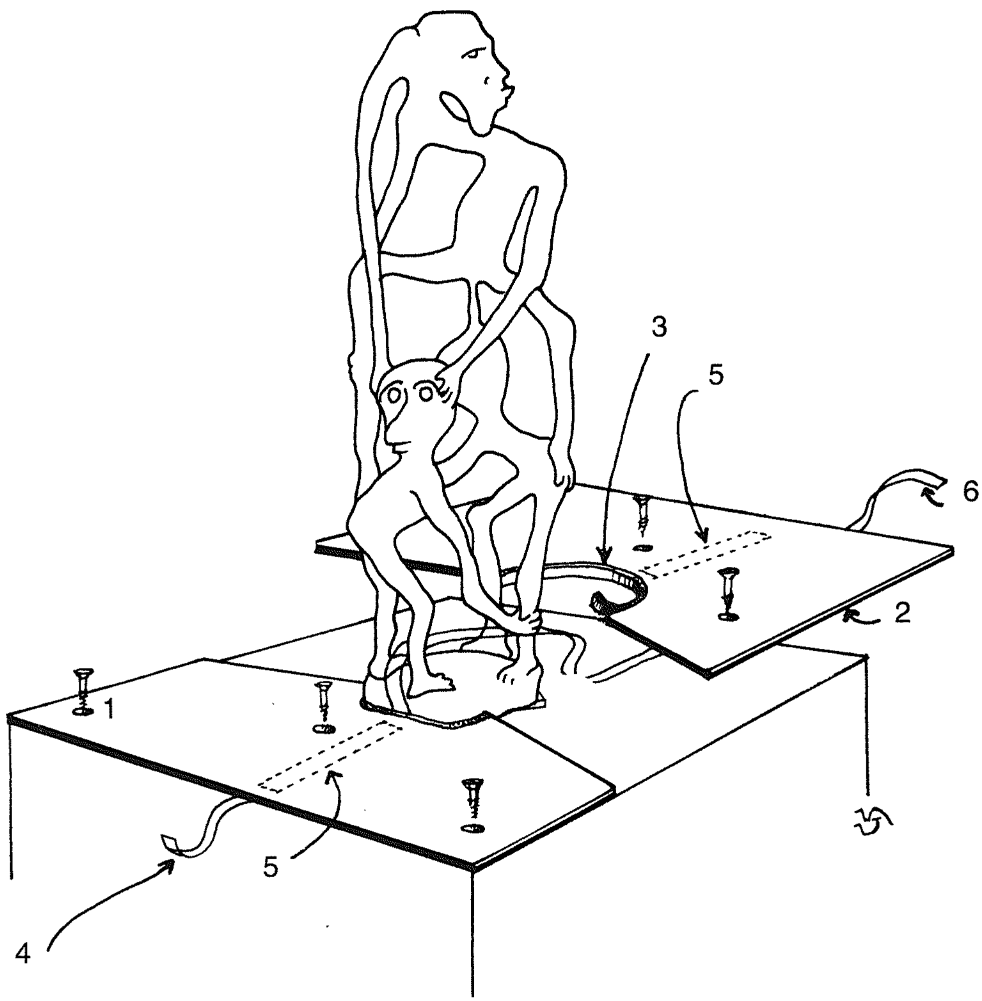


Figure 5. This top-heavy sculpture was prevented from toppling by securing it to a base using a strip of polyester film (Mylar). The base can be made of any suitable material provided it is stable and inert, or has been properly sealed. The first section of the base (1) is screwed down, trapping the Mylar strip (4) against a short section of double-sided sticky tape (5). The edges of both base pieces are lined with cross-linked polyethylene foam (Nalgene) (3) to cushion them against the edge of the sculpture. The second piece of the base (2) is brought up to the edge of the sculpture, and the Mylar strip (6) is pulled tight before setting the piece in place. Like the first base piece, it also has double-sided tape underneath. When the screws are tightened the Mylar strip is trapped underneath. The base is then covered with fabric to conceal the join and the screw heads.

The points of contact cause damage.
Mounts made of hard plastic, metal, or wood must have sufficient surface area in contact with the artifact to distribute its weight safely. In most cases it is also necessary to pad the points of contact with a soft, stable material. Narrow or unpadded points of contact can cause abrasion or permanent distortion (Figure 6).

The mount is made of an unsuitable material.
The materials comprising a mount should not cause damage to the object displayed. Only materials of known long-term stability should be used for mounts (see discussions on undesirable materials, below).

The finished mount is obtrusive.
Even if the four conservation considerations above have been addressed, a mount can still be aesthetically unattractive. As mentioned previously, the wide range of materials and techniques available make it possible to choose an appropriate design for each specific application.

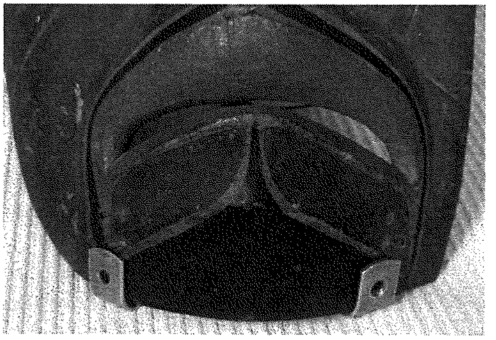


Figure 6. Care must be taken to assess whether or not metal brackets or retainers, even padded ones as shown here, are appropriate (i.e. will not cause dents, marks, or abrasion.) For softer or delicate materials such as painted wood, increasing the area of contact or using retainers of comparable hardness are possible solutions. Photo: Canadian Conservation Institute.

Overview of Elements to Consider when Creating a Mount for an Object

Materials	Design	Securing ties or tabs
• strong enough to support weight of object	• object balanced on mount using its centre of gravity	• monofilament, fasteners, or other mechanical means prevent object from toppling off mount
• stable or compatible with those of object	• not in conflict with object's original intended position	• not too tight
• padded where in contact with object	• compatible with display height and angle in display case or area	• padded
• no sharp edges	• points of contact correctly placed and of sufficient area	• non-abrasive
• non-abrasive	• long-term effects such as droop and sag prevented	• not permanently attached so object can be easily removed when necessary
• colourfast	• effects of vibrations dampened	• unobtrusive
• economical and durable	• object can be easily removed from mount when necessary	
• unobtrusive	• weight of object supported by mechanical joins rather than adhesive joins	
	• reasonable fabrication time	
	• unobtrusive	

Materials for Mounting Artifacts

Two interrelated aspects must be considered when constructing a mount for a museum object: the design of the mount and the materials from which it will be made. In the following section, the composition, physical properties, and possible uses of a variety of safe materials are discussed. As only stable materials should be used in contact with objects, problems and restrictions in the use of certain materials are also discussed; newly available materials should be avoided until their stability can be determined.[1]

A list of manufacturers and suppliers for safe materials, as well as further information, is available from CCI or CCQ. Large regional museums and conservation centres are also good sources of information.

Materials have been divided into three groups, according to their basic functions in the overall design of a mount:

base materials, which provide strength to sustain the load;

padding materials, which provide cushioning for the object, **and finishing materials**, which provide an even, neat finish for the mount; and

retainers and fasteners, which can be used to join different parts of the mount together or secure the object onto the mount, **and adhesives**, which join different parts of the mount together; **miscellaneous materials** have also been included in this group.

Base materials

Acrylic sheet (Acrylite, Lucite, Perspex, Plexiglas, Rohaglas, Oroglas, Altuglas, Goldglas)

Acrylic sheet is popular for mount-making because its appearance, when finished well, is unobtrusive. Sheets of 1.6, 3.2, 4.8, and 6.4 mm (1/16, 1/8, 3/16, and 1/4") thickness, as well as rods ranging from 1.6 to 25.4 mm (1/16 to 1"), are useful in mount-making; acrylic cylinders are also available in a variety of diameters. The most commonly used acrylic sheeting is transparent, but a variety of opaque or translucent colours as well as a range of smoky tints are also available. The surface of acrylic can be matted by light abrasive blasting, or it can be purchased with a frosted surface. Acrylic sheet sold commercially can be either cell-cast or continuously manufactured (also called extruded). The cell-cast type has better optical clarity and, because it has a higher molecular weight, it is stronger, more resilient, and more resistant to dissolution than the extruded type. In contrast, the extruded acrylic sheet is more economical and offers superior forming capabilities; it also has a definite machine direction. Acrylic sheet can be cut, drilled, and polished using ordinary hand tools (see "Plexiglas cutting and polishing kit" in the Appendix for a more complete list of the tools required for working with acrylic sheet), sculpted using a Dremel tool and dental drills, or heat-formed using a gas torch or a heating wire. It can be joined within a few minutes using a solvent adhesive or a longer-setting gap-filling cement, but the result is not strong enough to be a load-bearing join; bending the acrylic, rather than joining pieces at an angle, is a stronger and less time-consuming alternative. One of the main advantages of acrylic sheet is its versatility — it can be formed into a panoply of complex shapes fairly easily. As well, because of its transparent nature, a mount made of acrylic sheet may be less visible than one made of an opaque material (although the edges of acrylic sheet do catch the light in a way that can be distracting for some types of objects or display styles). The disadvantages of acrylic sheet are that it must be perfectly finished, it scratches easily

[1] CCI's Analytical Research Laboratory tests commercial materials to assess their suitability for mount-making or display purposes.

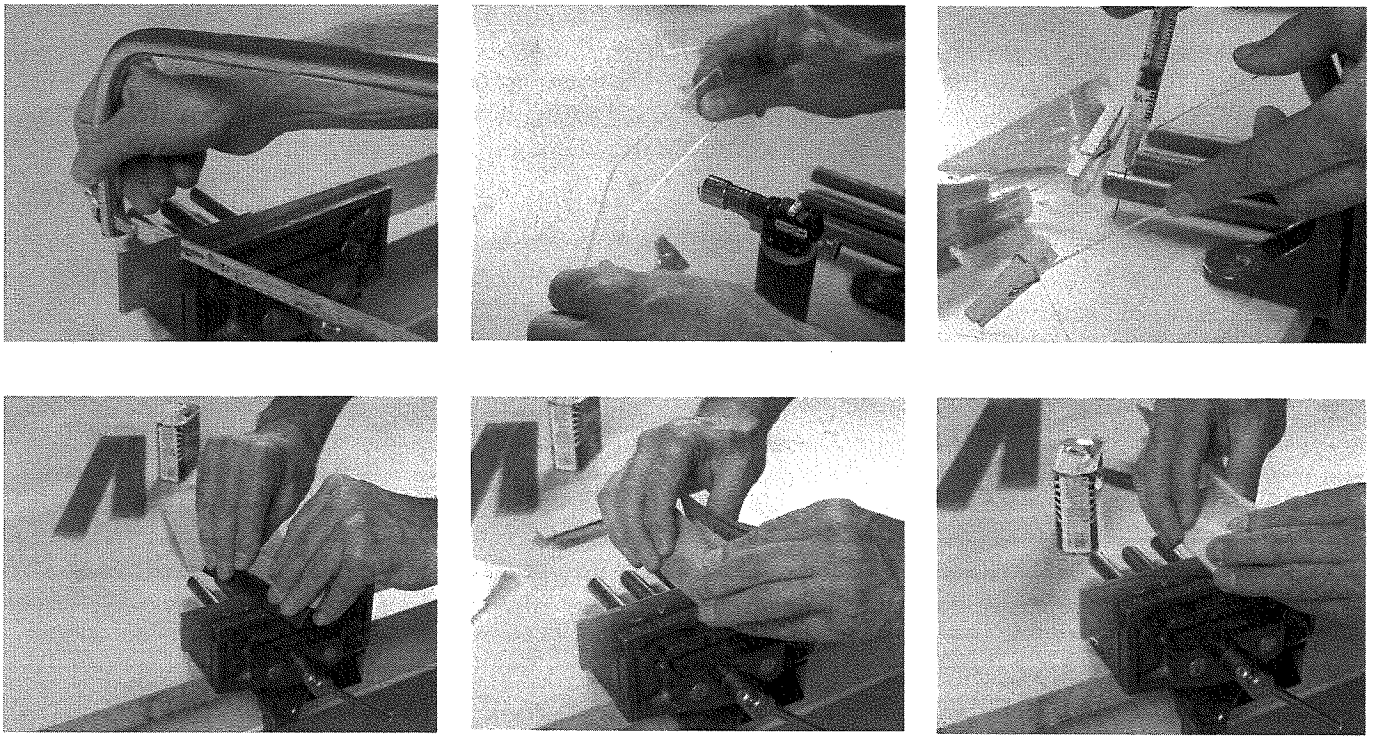


Figure 7. Working with acrylic sheet. Top row: (left) cutting with a hacksaw; (centre) bending with a torch; (right) gluing with cement and a syringe while strips are held together with clothespins. Bottom row: finishing the edges by (left) scraping; (centre) sanding; and (right) polishing. Photos: Canadian Conservation Institute.

(even the scratch-resistant version is susceptible), and it tends to attract dust due to its static charge (although specially formulated antistatic cleaners can alleviate this). Additionally, its surface can become crazed if subjected to stress or exposed to chemicals such as alcohol- or ammonia-based cleaners, although this is substantially less likely to occur with the cell-cast type than with the extruded type.

Polycarbonate sheet (Lexan, Tuffak)

Polycarbonate sheet is a transparent plastic sheet that is reported to be 30 times stronger than acrylic sheet. It resists shattering and is virtually unbreakable, and this impact-proof security feature is its main advantage. Thin polycarbonate sheet can be bent without heating and can be cut with tin snips, making fitting of complex mounts easier than with acrylic sheet. However, it is less perfectly transparent than acrylic and it cannot be as easily glued, cemented, or polished. It is available in clear sheet, as well as in a variety of transparent and opaque colours. The most convenient thicknesses are 1.6 and 3.2 mm (1/16 and 1/8″). Scratch-resistant varieties are also available.

Wood and wood panels

Wood is an excellent basic construction material for a wide range of mounts. Not only can it support moderately heavy loads, but it is easy to cut, shape, and finish; it also accepts staples, nails, screws, or fasteners with no trouble. Its main disadvantage is that it emits acidic volatile compounds. This problem is compounded in wood products, which are usually made of chips, sawdust, or small particles held together with adhesives that also emit acidic volatile compounds. Most wood-based products also tend to be weaker than wood or plywood and do not take screws or nails as well, making them unsuitable for mount-making. Exterior-grade plywood is an exception; with its stable adhesive and good working properties, this strong material is as acceptable as wood.

> *Do not use* interior-grade plywood, chipboard, particleboard, or fibreboard as their adhesives are typically urea formaldehyde, which is prone to degradation and off-gassing of formaldehyde. Chipboard, particleboard, and fibreboard also have poor working properties and the quality of their wood-based material is not well controlled.

Wood surfaces should not be in direct contact with an object, and should usually be sealed. A practical means of sealing wood is by heat-setting Marvelseal, a plastic and aluminum laminate, onto the surface (see "Padding and finishing materials"). However, if it is desirable to show the grain of the wood in the mount, acrylic or vinyl acrylic latex varnishes can be used provided they are allowed to dry for at least a month to off-gas. Another option is high-density overlay plywood; this is plywood with resin-impregnated paper that covers (and seals) one or two faces of the core. Only boards with overlay on both sides should be used, and ends that could off-gas should be sealed. Overlaid boards have the advantage of being more scratch-resistant than painted surfaces. Other sealing options include painting the wood with acrylic or vinyl acrylic latex paints, or adhering melamine or high pressure laminate sheeting (e.g. Arborite or Formica).

Not all objects are affected by the volatile compounds emitted from wood. Metals (especially lead and copper alloys) and paper are known to be damaged, and some organic materials such as shells, bone, and fabrics are generally considered at risk. The extent of the problem depends on several factors:

- whether or not there is direct contact (direct contact should be avoided or at least minimized with coatings, layers of padding, or barriers such as plastic-coated aluminum foil);
- the surface area of wood exposed (dowels or small wood components in a mount present a negligible problem as long as padding materials prevent direct contact); and
- the amount of ventilation (good air circulation in the display area helps to dissipate harmful volatile compounds).

The problem of volatile compounds emitted by wood and wood-based products, and possible mitigation strategies, are well documented in the literature (see references by Jean Tétreault in the Bibliography).

Polyethylene foam plank (EthaFoam, PolyPlank)

Polyethylene foam comes in various densities, or hardnesses, which can be selected to suit the application. White (uncoloured) or black (containing carbon black, a stable additive) products are recommended.

> *Note: It has recently been found that some types, brands, or batches of polyethylene foam can become brittle, a condition that is invariably accompanied by a rancid smell and yellowing. This problem is currently under investigation. The degradation does not appear to be a widespread occurrence for all types or brands. As well, it appears that the degradation is manifested by a mechanical change in the properties of the foam (brittleness, less cushioning, etc.) but not by evolution of chemical products that can cause chemical damage to adjacent objects. For these reasons polyethylene foam is still generally considered a safe, stable material for use in mount-making.*

Mounts for complex shapes can be built up in thin layers of polyethylene foam or carved from blocks. The full blade of a utility knife or a long, sharp cake knife can be used to carve polyethylene foam in silhouettes; curved knives such as sharpened grapefruit knives can be used to carve out cavities in polyethylene foam for objects with rounded or irregular bases. Rough edges from cuts can be smoothed with a hot air blower. Slits can be cut easily in a polyethylene foam base to allow padding and finishing materials covering the foam to be wedged in. Polyethylene foam can be adhered with hot-melt adhesives, double-sided tape, or heat welding; slabs can also be joined together with dowels. The foam is resistant to solvents at room temperature. CCI Technical Bulletin No. 14 *Working with Polyethylene Foam and Fluted Plastic Sheet* contains details on how to cut, shape, glue, and weld this type of foam.

Do not use pink, blue, or green polyethylene foam as these products may contain harmful additives.

Extruded polystyrene foam plank (Styrofoam)

Extruded polystyrene foam is often marketed for insulation purposes (these are then fire-retardant), and is available in white, blue, or pink.

Note: This foam contains a small amount of unreacted styrene monomer that is released into the air (according to the manufacturer, at room temperature the levels are in the order of 0.2 ppm for Styrofoam polystyrene foam insulation). However, to date there is no evidence that extruded polystyrene foams cause damage to museum artifacts.

Extruded polystyrene foam can be carved into various shapes, although less easily than polyethylene foam because it is not so flexible. Small pieces can be difficult to carve because they tend to snap under applied pressure; polyethylene foam is more resilient in this regard, but it is also more costly. Extruded polystyrene foam is hard and should generally be padded. It cannot be welded by heat, nor easily glued with hot-melt glue; double-sided tape can be used for non-load-bearing joins. Polystyrene foam is soluble in many of the solvents found in aerosol adhesives and paints. Dust and slivers from cuttings have a static cling that can be messy.

Do not use expanded bead polystyrene foam as the beads eventually shrink and separate from each other, causing the plank to weaken and fall apart; also, because of their static charge, loose beads cling to almost any surface with which they come in contact.

Matboard

Matboard is excellent for light, flat artifacts, e.g. a paper document or flat textile piece can be laid on matboard at an angle in a display case. Matboard can be cut, formed, and glued to make mounts for intricately shaped artifacts; in particular, its flexibility and spring allow for soft, smooth curves. It can be fastened easily using gummed linen tape, double-sided tape, hot-melt glue, or a variety of mechanical fasteners. It comes in thicknesses of 2-, 4-, or 8-ply. Archival quality (acid-free, buffered or unbuffered) matboard, which is usually available from art or framing shops, should be used.

Do not use acidic matboards. The finest quality acid-free matboard is made of 100% cotton fibres, buffered or unbuffered, but acid-free buffered wood pulp can also be used. Unbuffered acid-free materials are recommended for proteinaceous materials such as leather, skins, furs, wool, feathers, and horn. Buffered matboard is useful in other cases because its alkaline buffer will counteract acids in the environment for some time and thus remain stable.

Do not use matboards that are not colourfast. To test colourfastness, place a piece of the matboard in a small container of water for approximately 1 hour, then press it between sheets of blotting paper. If the slightest colour transfers onto the blotter, the matboard is not colourfast. Local suppliers will usually provide small samples for testing.

Corrugated plastic board (Coroplast, Cor-X, Hi-Core, Plastiboard, PolyFlute)

These are corrugated (or fluted) polypropylene or polyethylene/polypropylene boards that look similar to corrugated cardboard and are light, stable, and fairly strong. They are available in flute thicknesses ranging from 2 to 7 mm (0.08 to 0.28″), and in a variety of colours. Although semitransparent boards are available, opaque boards are likely to be more durable because light cannot penetrate into the mass of the plastic (the light is totally absorbed very near the surface, thus restricting photodegradation to the surface layers). Coroplast is available in an archival grade that does not contain an ultraviolet inhibitor; however, as this additive should not cause problems, the more economical grade can be used. Hi-Core has larger flute sizes, starting at 6.4 mm (1/4″). Corrugated plastic board can be used for flat mounts or folded into boxes. It can be bent by applying heat from a gas torch or hot wire, or by cutting one side of the flute wall. Bending is easier in the direction parallel to the flutes, but is also possible across the flutes. The surface of the board can be slit with a knife to allow thin foam, felt, or fabric to be wedged in, to create a clean finish. Dowels can also be inserted into the flutes to join two pieces together, or to attach other parts of the mount. Corrugated plastic board is not easily adhered and therefore mechanical joins are constructed using brass rivets, Adjust-A-Lok rivets, hot-melt rivets, staples, or twill tape ties. CCI Technical Bulletin No. 14 *Working with Polyethylene Foam and Fluted Plastic Sheet* contains details on how to cut, bend, glue, and fasten this material.

Do not use fire retardant grades of corrugated plastic board, as these have a very high content of fire retardant additive which can migrate to the surface and damage adjacent objects.

Do not use antistatic grades, as these have an additive that migrates to the surface to prevent static charge.

Foam board (Artcor, Fome-Cor, Foam Board, Sturdy Board)

These stiff boards are sandwiches of foam, usually extruded polystyrene foam (although other compositions exist), within paper or plastic sheets. Sheets come in thicknesses of 3.2 or 4.8 mm (1/8 or 3/16″). Foam boards can be used as backing materials or as a replacement for wood parts in some applications. They cannot be easily cut into complex shapes by hand, but if required can be shaped with a band saw; they cannot be bent to shape. Only products of known stability should be used; these consist of polystyrene foam, acid-free paper, or ABS plastic, e.g. Artcor AC-03 (plastic overlay), acid-free Fome-Cor (paper overlay), Bienfang acid-free Foam Board (paper overlay), or Sturdy Board (paper overlay).

Do not use non-acid-free boards, and brands that have unstable products in them, e.g. Gatorfoam has paper skins impregnated with urea-formaldehyde that emits pollutants and turns yellow with time.

Do not use polyurethane cores because polyurethane is generally not stable or durable.

Avoid beaded polystyrene foam cores as the beads can easily break apart at the edges.

Metal

Metal strip, rod, sheet, or wire can be used for mount-making when strength is needed. Metal is particularly useful because, in addition to being strong, it can be bent (usually by heating) into a wide variety of curves and

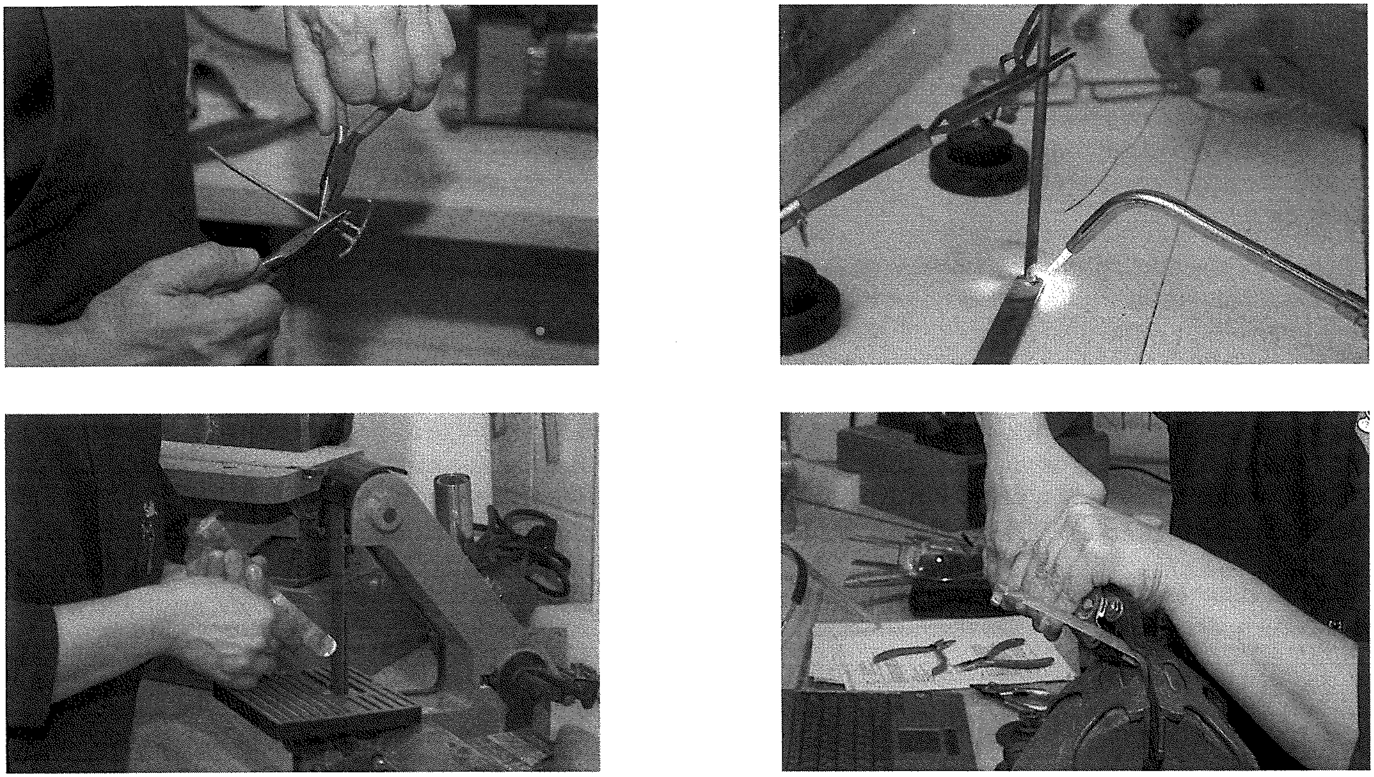


Figure 8. Shelly Uhlir working with brass. Top row: (left) light bending; (right) soldering. Bottom row: (left) grinding; (right) more bending. Courtesy, National Museum of the American Indian, Smithsonian Institution. Photos: R.A. Whiteside.

angles and, in most cases, it can be securely joined by soldering. Stainless steel is the strongest suitable metal but brass is easier to bend and becomes even softer after heating. Brass mounts are a fast, versatile option for lighter weight objects or low-load-bearing elements. Hard solder is preferable to soft solder for making joins in both steel and brass because the joins are much stronger, but brass can be soft soldered for low-load-bearing joins. Aluminum can also be used as a construction material for mounts, but it is difficult to solder and can be more conveniently joined with rivets or bolts.

Any metal wires and other components that contact objects must be covered and padded to prevent abrasion as well as corrosion, or staining from corrosion. For example, points of contact on metal strip or sheet should be isolated with cross-linked polyethylene foam or synthetic felts or suedes; on wire or rods they should be isolated with silicone or polyethylene (heat-shrinkable) tubing. Poly(vinyl chloride) (PVC) tubing should not be used.

> *Ensure that there is no* contact between two dissimilar metals (e.g. brass or steel wire in direct contact with a metal object), as this can result in localized corrosion, especially in humid conditions. This reaction is known as galvanic corrosion, and even two similar metals (such as brass in contact with brass) can be affected if there are small differences in composition. Corrosion of metals also occurs naturally when metals such as iron and copper alloys are exposed to humid conditions. This can limit itself to a thin layer of corrosion on the surface

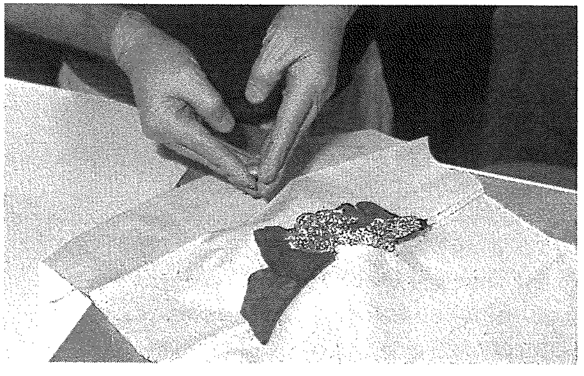
of the metal, but staining from surface corrosion products will occur if a museum object is in direct contact with the metal, e.g. orange rust stains on wood or fabrics and green copper corrosion products on oily leather objects. Corrosion products can also catalyse chemical reactions in organic materials, which speed up the process of deterioration and cause localized weakening. Monel metal and stainless steel are preferred if covering the metal is not possible.

Epoxy putty

Epoxy putty mounts are strong, smooth, unobtrusive, and conform perfectly to the object. Epoxy putty is a more complicated solution than a strong base material with several layers of polyester batting, but it is a useful option for small to medium-sized intricate objects that have curved or uneven surfaces, for which it is difficult to make a support with broad, evenly distributed points of contact. The putty is soft and kneadable like Plasticine when it is prepared for moulding against an object, and becomes hard upon curing (within a few hours). It is a relatively fast technique because the mould is made directly against the object without the intermediate stage of casting. Epoxy in a putty form is less messy than liquid moulding resins and minimizes the handling stresses on the object as all finishing steps are done on the hardened putty after it is removed from the object.

When using epoxy putty to construct mounts for museum objects, certain precautions are required to ensure the objects are not damaged:

- The shape of the epoxy putty mount must be such that it can be easily removed from the object, i.e. the putty must not key into the object.
- A release sheet must be used to protect the object and allow easy removal of the putty after it has hardened. Aluminum foil is recommended as a release sheet because it conforms well to any shape and is inert, easily removable after use, economical, and easily available; food wraps such as Handi-Wrap or Stretch-n-Seal also work well. To avoid any risk of epoxy putty inadvertently sticking to the object, the release layer must cover the object well beyond the area to be moulded.
- The surface of the object to be mounted must not be susceptible to damage from the heat generated as the epoxy putty cures. To reduce some of the heat transfer, the shiny surface of the aluminum foil liner should be placed against the epoxy putty, and the matte surface against the object.



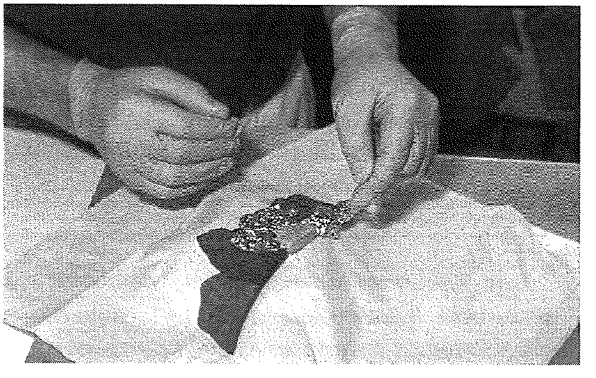


Figure 9. (Left) Two-part epoxy putty is kneaded; area of ceramic to be moulded is protected with aluminum foil. (Right) Epoxy putty is applied to the protected ceramic, shaped, and left to cure. Photos: Jean Blanchet, Centre de conservation du Québec.

- The object must be strong enough, and the surface sturdy enough, to withstand the pressure exerted as the epoxy putty is formed to the object's surface.

Putty should be applied sparingly so there is little excess to remove after it has hardened. The thickness of the putty can usually vary from about 2 to 10 mm (0.08 to 0.4") depending on the weight and form of the object. Continuous contact with the surface of the object is important, i.e. no air pockets. A spatula lubricated with soap lather can be used to smooth the surfaces of the putty while it is still soft and plastic, and still in contact with the object. After the cured putty has been removed from the object, files, grinders, or sandpaper can be used to remove any excess epoxy and make the surface smooth and even. A final finish can be obtained by sanding with wet 400 or 600 garnet paper, or by glass peening with air abrasive.

After finishing, holes can be drilled into the epoxy to allow the moulded support to be fastened onto a base (made of wood or acrylic sheeting, for example), or onto the base of a display case. Dowels of Plexiglas, aluminum, or stainless steel can also be used. The cured epoxy can be painted if required but it is preferable to colour the uncured putty using dry pigments, which can be slowly blended in with the fingertips after the two parts of the putty have been thoroughly kneaded together. This step is messy so it should be done in an area of the workshop that can easily be cleaned up afterwards, and gloves should be worn.

Cured epoxy makes a hard mount; therefore, an area slightly greater than the actual area of contact should be padded with cross-linked polyethylene foam, synthetic felt, or a thick fabric.

Padding and finishing materials

Polyethylene foam plank (EthaFoam, PolyPlank)

Polyethylene foam planks can be used as padding for mounts with heavy loads, and they are especially useful for covering wood and metal structures. However, they should always be covered with thin polyethylene sheeting, polyester batting, or fabric because, when the exposed surface is cut, the large cell size of this material can snag loose parts of artifacts. The surface pattern can also be impressed onto soft artifacts. Polyethylene foams are available in various levels of softness but they tend to crush under load, so sufficient thickness and surface area must be allowed for heavy objects. Polyethylene foam insulation dowels ('backer rods') or tubes are also available in hardware stores, in diameters ranging from 6.4 to 76.2 mm (1/4 to 3"). See also the information about the degradation of polyethylene foam given previously in "Base materials."

Polyethylene foam sheet (EthaFoam, PolyFoam, Astro-Foam, FoamFlex)

Polyethylene foam sheet is thinner than polyethylene foam plank. It is a convenient padding material for low loads; it can be cut easily and if necessary adhered with double-sided tape or hot-melt glue. Flat sheets are more practical than wavy varieties. A variety of brands of polyethylene foam sheeting and insulation sealing strips of 6.4 or 12.7 mm (1/4 or 1/2") thickness are commonly found in hardware stores. See also the information about the degradation of polyethylene foam given previously in "Base materials."

> *Avoid* (if possible) foams with additives such as antistatic compounds; such foams are often blue or pink in North America.

Polypropylene foam sheet (MicroFoam)

This foam sheeting is available as a single ply ranging in thickness from 0.8 to 2.4 mm (1/32 to 3/32"), or as a 3-ply sheet ranging from 3.2 to 9.5 mm (1/8 to 3/8") thick. It can be used in the same way as the thin polyethylene foam described above, and can be recognized by the squeaky sound it makes when rubbed against itself.

Avoid (if possible) foams that contain factory recycled material.

Avoid foams that contain additives such as antistatic compounds; such foams are often pink.

Cross-linked polyethylene foam sheet (MicroCell, Nalgene, Plastazote, Volara) and cross-linked ethylene vinyl acetate foam sheet (Evazote, Volara E-grade)

These materials come in a broad range of densities, or softness; they can be softer and more spongy than polyethylene foam, and the small cells snag much less when cut. They normally come in thin sheets that tend to crush under load, so they can be used for padding artifacts of low to medium weight only. They can be adhered with hot-melt adhesive, by heating alone, or with double-sided tape.

Do not use polyurethane foam. This is a soft spongy foam when freshly made, but it is very unstable. It yellows and loses its physical properties in a short time, turning into a powder. It can also chemically attack objects with which it is in contact.

Polystyrene foam pellets (Styrofoam pellets)

Small cloth or plastic pouches filled with tiny polystyrene foam pellets can occasionally be used for cushioning. However, the resultant padding is not as soft and uniform as polyester batting or thin polyethylene foam, and it is limited by gravity because the pellets tend to settle at the bottom of their pouch. Styrofoam pellets have an electrostatic charge and cling to anything with which they come in contact, so care must be taken to seal them properly within their plastic or fabric pouch.

Small polystyrene foam beads can be difficult to work with, and to contain within a pouch. Larger beads or S-shaped peanuts are generally too big, and tend to settle too readily, to offer adequate support. Thinner spaghetti strands do not settle as much as peanuts or pellets.

Polyester quilt batting

This polyester padding material is sold in rolls (to make quilts) and can be layered as needed. It is useful for padding lightweight artifacts such as textiles, but can also be used on wood, metal, and plastic structures, and makes easy and uniform padding for matboard, Fome-Cor, or Cor-X mounts. The great compressibility of quilt batting makes it particularly useful for padding uneven or curved surfaces (the batting acts as a filler material between the base and the object, conforming to the object's profile and distributing the load evenly). Unfused batting consists of mechanically entangled fibres in a sheet form; it is the softest type and is recognizable because the fibres can be pulled apart easily. In heat-fused batting the fibres are welded to each other; it is rougher in texture but has more plumpness than unfused batting.

Do not use batting in which the fibres have been bonded with an adhesive containing formaldehyde. These fused battings are usually more difficult to pull apart than unfused battings. In addition, tiny drops of adhesive will be visible under magnification (Figure 10).

Polyester fibrefill

This consists of loose polyester fibres entwined to form a soft, plump, lightweight, cushioning material useful for filling large, flexible three-dimensional objects such as moccasins, shoes, gloves, hats, or other costume accessories; it is not as suitable as polyester quilt batting or felts for lining flat surfaces. The fibrefill can be teased out and rolled to make small cushion balls or cylinders, or plumped together to provide large-volume filling material. It is available in large bags from fabric suppliers or department stores.

Do not use fibrefill materials that are fused with formaldehyde-containing adhesives (see note concerning polyester battings).

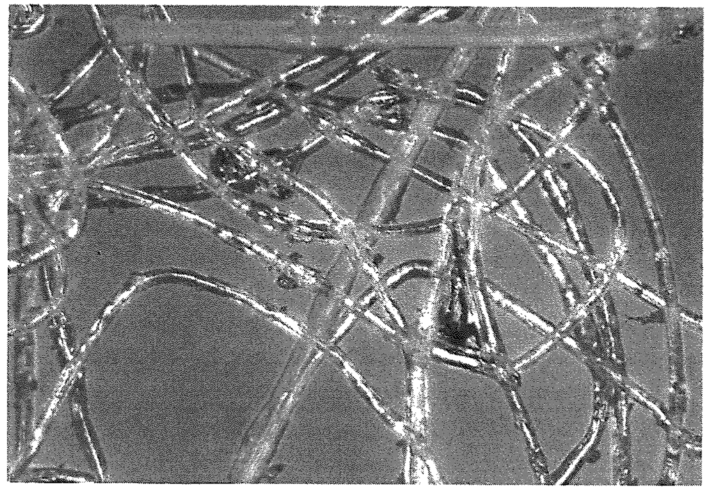


Figure 10. Battings that have been bonded with adhesive often show webs of adhesive where fibres cross, or droplets of adhesive along the fibres. Photo: R. Scott Williams, Canadian Conservation Institute.

Fabrics (jersey knits, plain weave, velvets, etc.)

A wide variety of fabrics can be used for covering mounts: unbleached linen, cotton, polyester, cotton/polyester blends, or silk are best for internal support, but in visible applications the colour, smoothness, and texture can be chosen to match the purpose. For example, velvet with a thick nap can be used as both a padding and finishing material, as its nap provides cushioning as well as friction to secure an object displayed at a shallow angle. Jersey or double-knit fabrics can be stretched to conform to three-dimensional shapes and contours. All fabrics should be washed to remove sizing and finishing products.

Do not use jute and hemp as they are acidic in nature and should not contact sensitive artifacts such as metals or seashells.

Do not use wool as it emits sulphur compounds that can tarnish silver, corrode other metals, and possibly affect organic materials.

Do not use non-colourfast materials as exposure to water (e.g. from leaky roofs or pipes, floods, fire control systems, condensation, etc.) could cause irreversible colour staining. To test for colourfastness, dampen a small area of the cloth, sandwich it between blotting paper, and place it under a weight. After 30 minutes, check the blotting paper: if it is coloured, even slightly, then the fabric is not colourfast and should not be used. Usually, suppliers will provide small samples that can be used for tests prior to purchase. See CCI Notes No. 13/14 *Testing for Colourfastness* for more details. All coloured materials used for supporting and displaying objects should be tested, even if they are not in direct contact with objects.

Avoid fabrics that are not lightfast. (This is an additional consideration that has no direct bearing on mount-making, but even lighting at the low intensities recommended for museum objects can sometimes cause modern fabrics to fade appreciably.) To test lightfastness, cover half of a sample with a piece of matboard, and expose it to light from a north-facing window for 5 days. If a difference is seen, the material is not lightfast.

Tubular knits, jersey stockinette

These cotton double-knit fabrics are available from medical suppliers as tubular support bandages of various diameters ranging from 5 to 25 cm (2 to 10"). They are convenient for making internal mounts for hats, moccasins, and boots; their stretchiness makes them easy to stuff to conform to any shape, and very little stitching is required to finish the mount after stuffing. However, they are expensive and the fabric can be coarse and might catch on delicate parts of artifacts.

Do not use varieties that incorporate rubber elastic within the weave (e.g. Tubigrip); these can be made of natural rubber, which could degrade and fail, and also emit sulphur compounds.

Do not use Spandex; its polyurethane elastomer fibres do not emit gases, but will eventually lose their elasticity.

Synthetic felts and suedes

Synthetic felts such as Insulite can be used in the same way as the other padding materials described above; in particular they can be applied with double-sided tape to points of contact. Deccofelt is a commercially available self-adhesive felt made with an acrylic-base pressure-sensitive adhesive with good long-term stability; it can be cut to fit the contact surfaces of acrylic or polycarbonate sheeting, hard foams, metal, or wood mounts. The felted padding is not very thick so its use should be limited to locations where loading is fairly light. It is sold in sheets of 22.5 by 30 cm (9 by 12") or rolled tape 1.25 or 2.5 cm (½ or 1") wide, and comes in at least 15 colours. Acrylic adhesive-backed polyethylene suedes are also available in sheets of 22.5 by 33 cm (9 by 13") and five different colours. At 0.4 mm (0.015") thickness, self-adhesive suedes are thinner than self-adhesive felts and should therefore be used only for lighter loads.

Do not use wool felts as wool emits sulphur compounds that cause tarnishing and possibly other reactions harmful to objects.

Do not use coloured felts with unstable dyes that can run when wet; all felts should be tested for colourfastness before use (see "Fabrics" above).

Cotton gloves

The fingers of white cotton gloves are a convenient source of small-diameter cotton tubing for a variety of uses. The whole glove can also be used as an internal lining material covering the padding of a mount for a displayed glove. White cotton gloves are available from photographic stores or supply houses, and should be washed before use.

Tubing

Where metal wires or monofilament or multifilament lines are used, surgical- or medical-grade polyethylene or silicone tubing can be used to provide padding. These tubes are available from medical suppliers in various inside and outside diameters, ranging from 0.28 mm (0.011″) ID/0.61 mm (0.24″) OD, to 15.9 mm (0.625″) ID/22.23 mm (0.875″) OD. Another padding option is heat-shrinkable tubing, which is available from electronics stores and packing material supplies companies. It can be placed over the metal and heated gently with a hot air gun or micro-torch to shrink it into place. Polyolefin heat-shrinkable tubing is available in ID sizes ranging from 1.6 to 9.5 mm (1/16 to 3/8″), and requires temperatures of approximately 135°C to be reduced down to half of its original inside diameter. Polytetrafluorethylene (Teflon) heat-shrinkable tubing, available in ID sizes ranging from 2 to 6 mm (0.08 to 0.24″), requires approximately 350°C to be reduced down to one-quarter its original inside diameter. Heat-shrinkable tubing is fairly hard and therefore provides only limited padding for hard, robust surfaces; it is, however, efficient as a barrier between the metal and the artifact. Polyethylene and silicone tubings are less glossy, more cushiony, and give a better grip than heat-shrinkable tubing.

Tubing should usually be slipped on metal after it is bent. However, when the bends will be quite sharp, the tubing can be slipped on before the wire is bent; in such cases extra care must be taken while bending the wire to avoid damaging the tubing.

Do not use brands that do not specify either polyethylene, polypropylene, fluorinated ethylene propylene, polyolefin, silicone, or Teflon. Although there are many other types of flexible tubing on the market, they are not recommended due to their questionable stability: some of them can cause corrosion or other undesirable effects on the artifact. For example, vulcanized rubber tubing emits sulphur compounds that can rapidly tarnish silver. It can also corrode metals in general, and might degrade organic materials. PVC flexible tubing is another example. Although it is common and fairly soft and flexible, it readily degrades and oozes plasticizer that sticks to, and stains, surfaces with which it comes in contact. PVC can also emit hydrochloric acid as it degrades, which damages and corrodes materials with which it is in contact. The Beilstein test (CCI Notes No. 17/1 *The Beilstein Test*) is an easy method to determine whether or not a piece of plastic is made of PVC. However, it is often difficult to distinguish 'safe' tubings from 'bad' ones so the safer alternatives mentioned at the beginning should always be chosen.

Avoid painting any section of tubing that is in contact with an artifact as the paint could smear onto the artifact and cause damage.

Paints and varnishes

Paints and varnishes require time to dry and off-gas their harmful volatile compounds; finishing a mount with coloured fabrics or matboard is much quicker. If a paint or a varnish is to be used in displays, the safest ones are two-part epoxies or acrylic or vinyl acrylic latex emulsions, but even these should be allowed to cure and off-gas completely. In closed displays or close proximity situations, recommended off-gassing time is 4 weeks. Clear acrylic sprays such as Krylon Crystal Clear can also be used. For more information on the choice of paints for displays, see Technical Bulletin No. 21 *Coatings for Display and Storage in Museums.*

> *Do not use* oil- and alkyd-based paints and varnishes as they produce vapours that can harm artifacts in confined spaces.

Plastic-coated foil (Marvelseal)

Marvelseal 360 is a plastic-coated aluminum foil (nylon on one side, polyethylene on the other) that is highly impermeable to gases. It is used to seal wood and wood-based boards, and can be heat-sealed to the surface with an iron (Figure 11) or a hot air gun. The polyethylene side tacks onto a surface when heated; the nylon side is usually shinier than the polyethylene side and has the brand name printed on it.

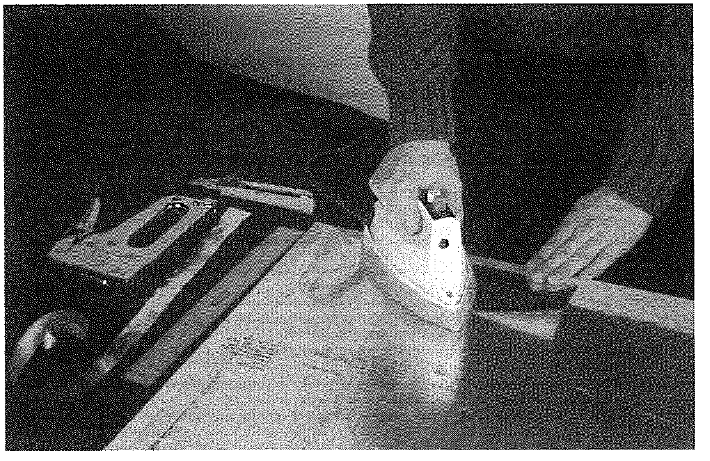


Figure 11. Plastic-coated foil is heat-sealed onto wood with an iron covered with Teflon-coated fibreglass. Note: A simple sheet of paper could be used between the iron and the foil instead of the Teflon. Photo: Canadian Conservation Institute.

Retainers, fasteners, adhesives, and miscellaneous materials

Adhesives

Adhesives should never be used directly on artifacts: silicone adhesives leave residues and stains that are almost impossible to remove from most surfaces, and museum wax ('sticky wax') will also leave residues. Only friction and mechanical methods should be used for securing artifacts.

The use of adhesives for joining the components of mounts can lead to problems. Commercial adhesives can become brittle with time and lose their adhesive strength, and some adhesives emit volatile compounds that are harmful to many artifacts, although in most cases the quantity used is too small to be significant. If used sparingly and allowed to dry well before use, acrylic solutions (e.g. Acryloid B72, Acryloid B67), acrylic emulsions (e.g. Rhoplex), PVA emulsions (white glues), ethylene/vinyl acetate copolymers (BEVA), and acrylic contact cement are acceptable. However, because of the impracticality of allowing adhesives to dry or set and their questionable reliability over the long term, the use of adhesive methods in mount-making is discouraged in favour of mechanical methods wherever possible. Exceptions to this general rule are listed below.

Adhesives for acrylic and polycarbonate sheeting

Acrylic (Acrylite, Lucite, Perspex, Plexiglas) and polycarbonate (Lexan, Tuffak) components can be adhered with either a solvent cement or a polymerizable cement (a gap-filling adhesive).

Commercially available solvent cements work by dissolving the plastic and effectively welding it together. The joins between components must be very close, and the surface of the acrylic sheet polished, to allow the solvent to flow in by capillary action and form a strong bond. A syringe can be used to inject the adhesive. Evaporation is very quick, and the join attains full strength in less than half an hour. Methylene chloride is the chief ingredient of commercial adhesives and can be used in their place. This solvent can be harmful so suitable precautions should be taken, e.g. working in a well-ventilated area or using an extraction system, and making sure to use only sufficient adhesive for the job at hand.

Where the joins between components are not close, a cement can be used. This is usually a viscous fluid containing dissolved acrylic; examples include Plexite and Weld-On cements. Overnight drying is recommended for joins made with filled adhesives.

Hot-melt glue

Hot-melt glues are sold in hardware stores and applied with a pistol dispenser. The white or clear varieties are stable in composition. Hot-melt glues set by cooling (usually within a few minutes), and stick to a wide variety of materials, but they cannot be used in applications that require strength. They do not stick well to smooth surfaces, such as fluted plastics, but are ideal for matboard, fabrics, foams, and thin, non-load-bearing wood products.

Double-sided tape

Scotchpar #415 double-sided tape by 3M is useful for adhering all sorts of materials and components, particularly fabric to foam bases, felt pads to wood or Plexiglas, foam to foam, etc. It should not be used in any load-bearing applications.

Gummed linen tape, holland tape

The adhesive of this tape is activated by wetting. It is useful for adhering matboard in non-load-bearing situations, such as the sides of cardboard boxes.

Solders

There are two categories of solder.

Soft solder contains soft alloys (mostly tin) that have low melting points. It can be done with an electrically heated soldering iron, and is suitable for low-load-bearing joins in brass.

Hard (or 'silver') solder contains hard alloys of silver, copper, and certain other metals that melt at higher temperatures than those in soft solder. Several grades are available, depending upon melting temperature:

the 'easy' and 'medium' grades are most useful for mount-making applications. Because of its high melting temperature, hard soldering requires the use of a gas torch (propane, butane, MPG, or acetylene). Hard solder creates stronger joins than soft solder, and is therefore the preferred choice for most applications in steel or brass.

The procedure is the same for both soft and hard solder: the join to be soldered is held in place, the area to be joined is coated with a flux, and heat is applied. When the join is hot enough to melt the solder, it is applied and allowed to flow around the join. After the join has cooled, flux residues (which are corrosive) should be cleaned off the metal; this can be done by scrubbing the metal with hot water or by abrading with fine files, fine emery paper, or fine sandpaper. Metals can also be cleaned by chemical pickling, which requires tanks, scrubbing brushes, and other handling equipment. A well-equipped workshop should include this sort of equipment, but it is not necessary when making only one or two mounts.

Monofilament and multifilament lines

Polyester monofilament and multifilament lines are sometimes used to suspend artifacts and secure them onto mounts. Lines are available in breaking strengths from 0.45 to 13.6 kg (1 to 30 lb.), and it is important to choose a line with sufficient breaking strength to support the load it will have to carry. At the very least, there should be no noticeable extension of the line when the object is hung as plastic that is stretched can snap. Although there are no exact data on this, as a general rule of thumb the line used to support an artifact should have a breaking strength of at least 10 times the weight of the object. To avoid strain that could lead to breakage, the line should not be

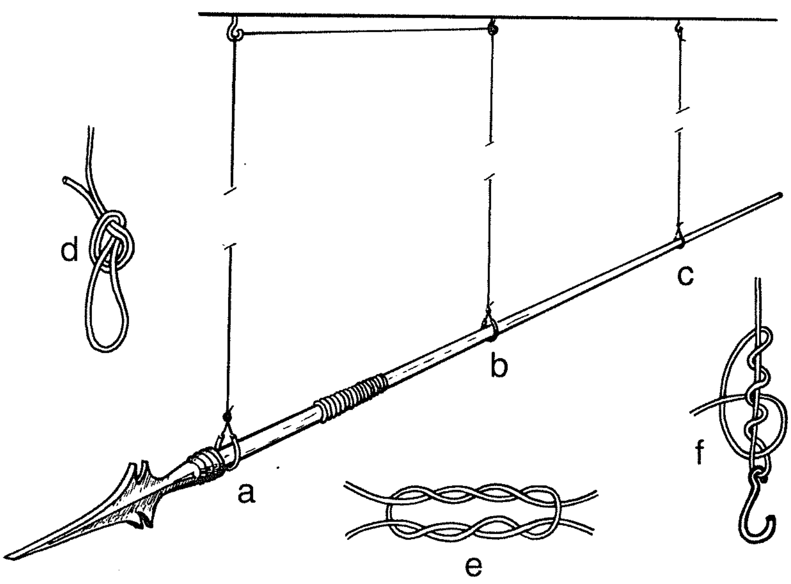


Figure 12. Long objects can bend in the middle if only two suspension lines are used. To prevent this problem, a third suspension line can be formed by creating a loop such as a-b. In this way the weight can be distributed evenly among three points. Because plastic lines are very smooth and the knots are prone to slippage, only non-slip knots (see examples in d, e, and f) should be used.

passed over sharp edges and corners. Plastic line also has a tendency to degrade over time, and should be changed every 10 years.

Monofilament line is less visible than multifilament line and is generally preferred for mount-making. However, multifilament line does have certain advantages: its breaking strength is higher than that of a monofilament line of the same diameter; a scratch or notch in a monofilament line can lead to stress concentration and catastrophic failure at much lower stress than its breaking strength, whereas a notch in a single strand of a multifilament line can lead to catastrophic failure of that strand but not necessarily of the entire line; and degradation of a monofilament line is not visible until the line breaks whereas multifilament line shows noticeable signs of fraying as the individual strands degrade and break.

Both monofilament and multifilament lines are hard and thin, and can cut into or abrade soft materials, so fine polyethylene tubing should be used to pad lines wherever they are in contact with the object. If three or four suspension points are required to hang a long lightweight object, loops should be formed with non-slip knots to ensure that the weight is distributed evenly to all points (Figure 12).

> *Do not use* nylon monofilament or multifilament line as it tends to degrade and become significantly weaker under ultraviolet light.

Wire

Brass, aluminum, and stainless steel wires all have uses as fasteners and tabs in mount-making. Brass has the advantage of being easy to join with either soft or hard solder, depending on the strength of the joins required. All points of contact should be padded with tubing. Electrical wires coated with polyethylene insulation can also be useful in securing objects onto mounts, or for a variety of attachment applications.

> *Do not use* PVC coated wires, which are quite common. To identify PVC plastics, see CCI Notes No. 17/1 *The Beilstein Test*.

Twill tape

Cotton or cotton/polyester twill tape can occasionally be useful for securing objects onto fabric-covered mounts, but it is usually too conspicuous to be used in display situations. Other securing methods, such as monofilament line padded with tubing, are less obtrusive.

Hook and loop fasteners (Velcro)

This product consists of two tape surfaces, one with tiny hooks and the other with randomly woven loops. It is available from a variety of manufacturers under a number of brand names. Most of these are made of 100% nylon and all have an adhesive binder (e.g. acrylic, polyurethane, or polyurethane cross-linked with isocyanate) on the back that strengthens the tapes and prevents fraying and slippage of the hooks and loops. As expected for nylon products and/or polyurethane coatings, hook and loop fasteners can show signs of ageing (e.g. yellowing, weakening, acidity, embrittlement, deformation of the hooks, tackiness of the binder coat, and emission of harmful volatile compounds) within 15 years; however, to date there appears to be only one reported incident of damage to a museum object caused by an aged hook and loop fastener. Brands made with an acrylic binder (e.g. Velcro from Velcro USA) appear to be the safest for mounting museum objects, second choice being those made with the cross-linked polyurethane (e.g. Velcro from Selectus Ltd.). As an added precaution there should be no contact between the fastener and the object; even close proximity should be avoided if possible. Hook and loop fasteners are available in fabric shops in a variety of widths, strengths, and colours. They can reversibly join two mount components; however, because it usually requires a fairly strong force to open them, care should be taken in the design so that no stress is applied to the object when the fastener is opened.

Do not use products with a pressure-sensitive adhesive on one surface as the adhesive is often unstable.

Brass rivets (Bildemup)

Bildemup brass fasteners, sold commercially to clip paper documents together, are very practical for joining mount components. Coroplast, foam boards, plastics, and matboard can all be held together through drilled or punched holes. Bildemup fasteners are available in sizes ranging from 9.5 to 101.6 mm ($^{3}/_{8}$ to 4″), but 19 mm ($^{3}/_{4}$″) or 25.4 mm (1″) sizes are the most useful. When using brass rivets in a mount, always ensure there is no contact between the rivets and the object; if necessary, isolate the rivets with padding.

Plastic rivets

There are various brands of two-part plastic rivet fasteners on the market. Screw types include Chicago screws available in white, black, and clear plastic and 16 different sizes ranging from 6.4 mm ($^{1}/_{4}$″) to 15 cm (6″); Instachange Adjust-A-Lok screw fasteners available in lengths of 6.4 and 12.7 mm ($^{1}/_{4}$ and $^{1}/_{2}$″); and POS Centre Quik Lock screws available in lengths of 6.4, 9.5, 12.7, and 19 mm ($^{1}/_{4}$, $^{3}/_{8}$, $^{1}/_{2}$, and $^{3}/_{4}$″). Non-screw types include Instachange Quik-Grip fasteners available in lengths of 9.5, 19, and 28.6 mm ($^{3}/_{8}$, $^{3}/_{4}$, and 1 $^{1}/_{8}$″), POS Centre Quick Clips, and Ratchet rivets. These plastic fasteners are useful for securing Coroplast, matboard, and sheet plastics.

Dressmaker's pins

Pins can be useful for joining parts of foam mounts together and for securing light artifacts, such as textiles, to foam or soft wood backings. Stainless steel pins should always be used.

Polyester film (Melinex, Mylar, Hostaphan, Terephane)

This stable, clear polyester (polyethylene terephthalate, or PET) film comes in a variety of thicknesses from 0.25 to 14 mil (0.00635 to 0.3556 mm; 0.00025 to 0.014″). Mylar type S, Melinex type 516 and 456, and Hostaphan 43SM, in thicknesses of 2 to 5 mil (0.0508 to 0.127 mm; 0.002 to 0.005″) are the most useful in mount-making applications. Mylar type D is also suitable but has been discontinued. Polyester film is preferred over other stable plastics such as polyethylene because it is strong and crystal clear, although it tears very easily from a notch. The cut edges of polyester film are harder and sharper than those of polyethylene. It can be joined with double-sided tape, and used in strips to secure small parts of objects, e.g. holding down the pages of a book on display.

Avoid coated grades, unless specifically required for sealing, adhesive, or gas-barrier properties.

Designing a Mount

Mount design is the most difficult step in mount-making, and it is a skill that can only be acquired through experience. The basic building blocks in mastering this include:

- good examination and hand manipulation skills to determine the needs of each specific object;
- practical experience with mount-making materials and techniques, leading to a good comparative assessment of their advantages and limitations;
- continued study of successful and not-so-successful mounts, and why some worked better than others;
- adherence to the principle of simplicity: whenever possible give preference to the design that requires the fewest number of materials, mount-making techniques, construction steps, etc.; and
- a mind frame keen on meeting each mount-making challenge and doing what needs to be done to come up with a perfect mount.

The following is an attempt to outline the thought process in mount designing. It is not a linear process, but rather one that goes back and forth between the object and its display requirements, mount materials, construction techniques, etc. The issues outlined are not comprehensive, but it is hoped they will be useful and possibly inspire other questions or issues relevant to each particular object and mount-making challenge.

Object needs

Examine the object visually and then manually by cradling/supporting it with hands and fingers. Look for any areas that are broken, torn, or repaired (a repaired object often remains structurally weak), and examine the joins, which may be weak or loose. Assess the object in terms of its:

- total weight, and whether or not the weight is evenly distributed;
- strength and degree of fragility/brittleness;
- ability to support its own weight and the weight of its components; and
- weak points and whether or not these need localized support.

This assessment will lead to a preliminary determination of:

- the strength required of the base material (main material of the mount), e.g. metal, Plexiglas, etc.;
- the location, size, and quantity of weight-bearing contact points; and
- the number and placement of any tabs or retainers required to ensure the object is held securely on the mount.

Display requirements

While assessing the needs of the object, consider the requirements of the display in terms of:

- the degree to which the mount should be inconspicuous;
- the style of the mount (some mount-making materials may not have the right appearance for the object or for the display context);
- the position, elevation, and angle required to show the object to best advantage;
- the placement of the mount (i.e. whether it should stand alone or can/should be fixed to a base or wall); and
- security issues that impact the mount design or required retainers.

Design options

The assessment of the object's needs combined with the display requirements, as well as a familiarity with the advantages and limitations of recommended materials in mount-making and an adherence to the principle of simplicity, will start to narrow down the design options in regard to the choice and shape of the base material, the retainers, and the padding and finishing materials.

Choice and shape of base material

The following considerations will help to identify suitable base materials and shapes:

- what materials (including size and thickness) could provide sufficient strength to carry the load;
- of the identified materials, how much shaping and working would be required to create sufficient contact points or areas of contact, and how time-consuming and difficult would this be;
- could the material be cut or shaped so as to avoid joins (joins could weaken the strength of the base material as well as add to the complexity of the design and the time required to construct the mount);
- would any necessary joins have to be structural (i.e. would they have to carry a heavy load);
- what fastening or joining methods would be strong enough for the joins; and
- could the object be easily and safely placed onto, and removed from, a mount of the selected shape.

Stabilization and prevention of toppling

It is important for the safety of an object that it sit securely on its mount. To ensure this condition is met, first imagine the object on the shaped base material that has been selected and then focus on the directions in which it could move on or fall off of the mount, i.e. up-down, front-back, or left-right. Consider whether or not this movement or toppling could be prevented by:

- inclining the mount;
- adjusting the position of the object on the mount;
- changing or extending the shape of the base material so as to cradle the object further; and
- extending the base area into recesses, cavities, or openings in the object (e.g. the inside of a glove, the bowl of a pipe, the inside of a purse) while ensuring that the mount remains easily removable.

These adjustments will usually solve at least part of the problem, although in most cases it will still be necessary to use retainers to secure the object to the mount (often at the top of the object, on both sides). To incorporate these into the design:

- determine the number and location of tabs;
- determine the material to be used, the shape of the retainers, and how they will be fastened; and
- ensure the object can be easily and safely placed onto, and removed from, the mount with its retainers.

Finally, ensure that the object and mount combination is well balanced, and heavy enough to withstand accidental jarring of the display case. If there is any risk of toppling:

- extend the base area of the mount in contact with the display case to be at least as broad as the girth of the object; and
- provide anchoring mechanisms to attach the base to the display case.

Padding and finishing

While choosing the material(s) and shape for the mount, consider whether or not the object is sufficiently cushioned and padded. In most cases the answer will be no, and it will be necessary to protect the object from the strong but hard base materials and retainers. When choosing padding and finishing materials:

- ensure the padding sufficiently cushions the load;
- determine how all the elements will fit and be held together (i.e. the use of adhesives, self-adhesive padding, mechanical interlocking, etc.); and
- create a final look that is aesthetically pleasing and/or unobtrusive (paint, fabrics) — if this is difficult to achieve, the choice and/or shape of base material and retainers should be reconsidered.

The final decision

Before making a final decision, revisit the planned mount design to determine whether or not these choices add up to the best possible mount-making solution — for the object's needs, the display requirements, and your own working situation (time, expense, available equipment, familiarity with materials and equipment, etc.).

Kiowa and Comanche cradleboards. Courtesy, National Museum of the American Indian, Smithsonian Institution. Photo: David Sundberg.

Measuring Artifacts for Mounts

A variety of measuring tools and techniques are useful in mount-making (Figure 13). These are indispensable for creating the accurate form-fitting shapes that are often required for museum objects, especially weak or damaged ones.

Pencils

As a matter of good museum practice, only soft graphite pencils should be used around artifacts to minimize the chance of damage; ink pens or markers should not be used.

Rulers and tape measures

Simple measurements of the artifact might be all that is needed to construct a mount. Fabric tape measures are the best choice as they are soft and thus pose little threat to the object. Rulers can be used on or near artifacts provided they are made of plastic. These are cheap and easily available and, although they are not as accurate as metal rulers, this is not important when merely transferring dimensions from one medium to another.

Flexible rulers

Flexible draftsman's rulers can be used to capture the shape of some curved surfaces. However, they can spring back a little if not held securely to a surface, and this can introduce inaccuracies. These rulers are limited to gentle curves.

Cardboard or paper templates

One of the gentlest and most accurate ways of transferring a shape is by using a template made of thin card, which is cut and trimmed to match exactly the shape of the object. Templates can also be built up from pieces of card stapled or stuck together. The information on the card is then transferred to the material from which the mount is to be made.

Calipers

Inside and outside measurement calipers or dividers can be useful. The metal tools that machinists use for this purpose are potentially dangerous around artifacts because of their hardness and sharp edges. Alternatives can be made with thin Lexan sheet; they are much less damaging to artifacts and much lighter in weight. Inexpensive plastic vernier calipers, available from some machine tool suppliers, are very good for mount-making.

Profile gauges

Commercial profile gauges consist of a row of wires or plastic rods in a spring-loaded holder. When pressed against an artifact the wires or rods are pushed in incrementally. An exact profile (with a resolution the thickness of the wires) is reproduced in reverse on the gauge. This can be used for sketching. The spring-loading of these gauges and their weight make them unsafe for use on fragile artifacts. As an alternative, a profile gauge can be constructed from thin wood dowels, Cor-X sheet, and linen tape, where the dowels are passed through the interior spaces of the Cor-X and tensioned with a linen tape passed around them (see CCI Notes No. 18/3 *Construction of a "Soft" Profile Gauge*).

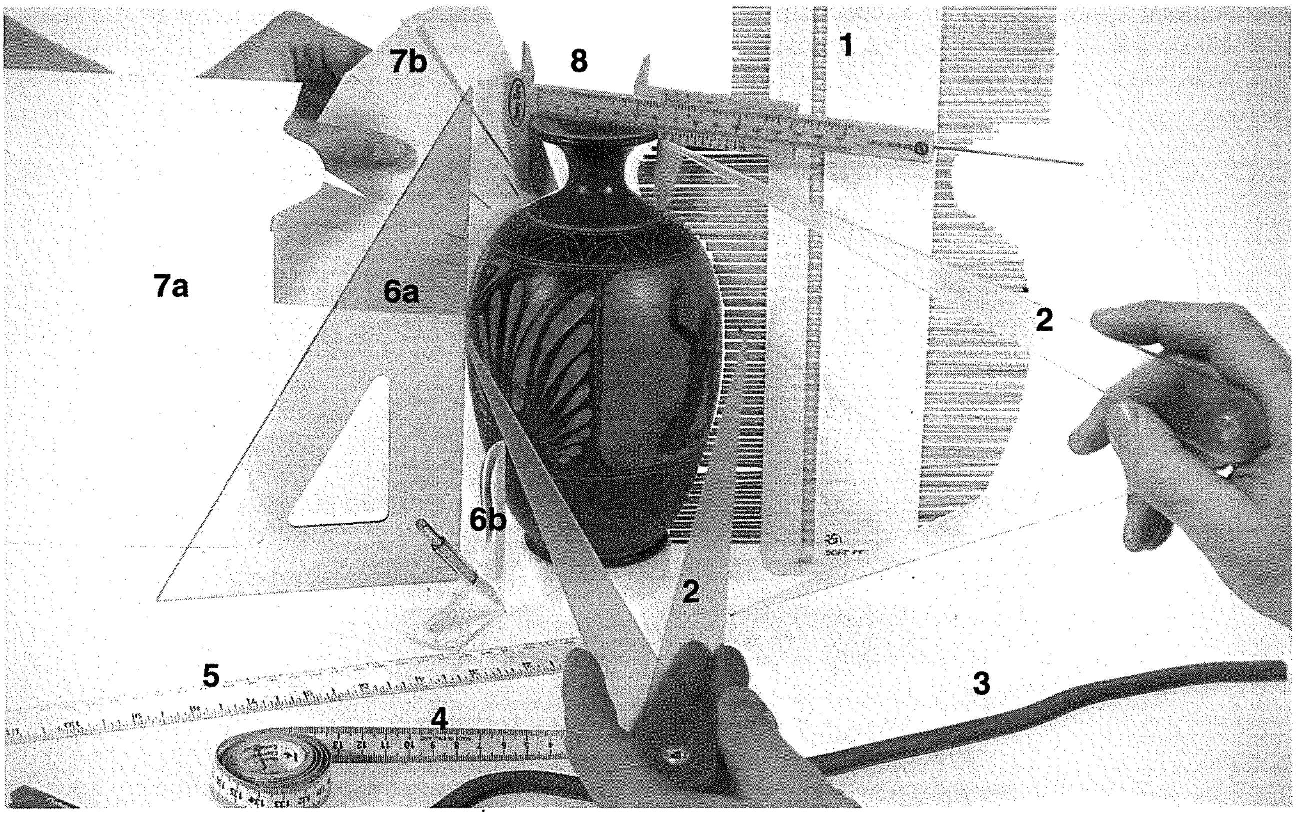


Figure 13. Some of the measuring techniques and tools described in this section: (1) handmade 'soft' profile gauge; (2) handmade Lexan dividers; (3) flexible ruler; (4) tape measure; (5) plastic ruler; (6) sketching from verticals (a) using a plastic square and (b) using a Plexiglas handmade square incorporating a pencil; (7) templates of (a) cardboard or (b) built up from pieces of card; (8) plastic calipers. Photo: Canadian Conservation Institute.

Sketching from verticals

The shape of an artifact can also be traced by setting it on a sheet of paper, or the mount-making material, and placing a carpenter's square against it from the side. The point at which the heel of the carpenter's square touches the paper is marked with a pencil and the square is then moved along a little and the process repeated. The dots so formed can be joined up with a pencil to produce the required curve.

Carbon paper

Carbon paper can be used to indicate pressure points on a mount. The paper is inserted between the mount and the artifact with the carbon side towards the mount. With slight pressure, the object is moved backwards and forwards a few millimetres on the mount. The pressure points will transfer carbon from the paper onto the mount material. The areas that appear black are then carved away and the process repeated (Figure 14). Skilful carving will produce a mount with wide and evenly distributed surface contact, indicated by small, evenly spaced black dots.

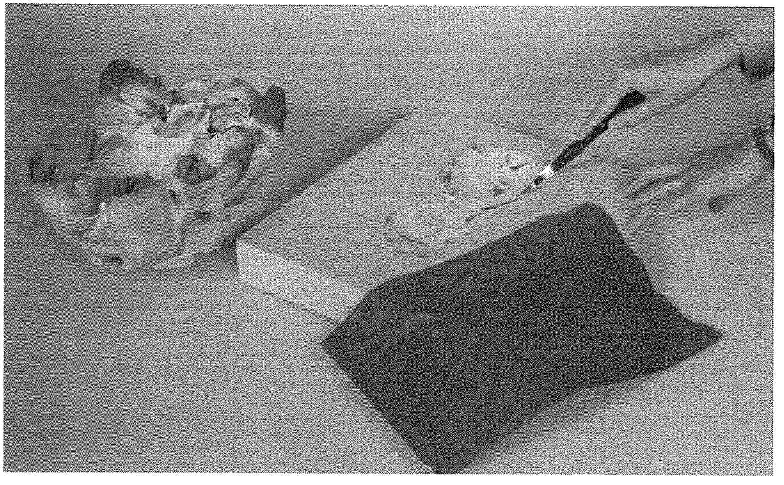


Figure 14. Carbon paper is used to assist in carving the shape of a natural history specimen (an animal skull) in extruded polystyrene foam. Note the black areas on the foam, indicating where there was contact with the object; these areas will be carved away to increase the size and number of contact points at the next fitting. Photo: Canadian Conservation Institute.

Before Starting a Mount

Mount-making always requires a certain amount of handling of artifacts. In fact, more damage can be done during the process of making the support than might be caused by years of inadequate display. Great care must therefore be taken, especially when making accurate form-fitting supports for fragile or unevenly shaped objects. Dedicated tools and specially designated work spaces will help to minimize the risk of damage to the artifact.

The following guidelines will make the mount-making process as safe as possible.

Keep the area used for mount-making clean and tidy, and remove all material that could potentially soil the artifact or work surfaces.

Establish clean and dirty work areas, and keep them distinct.

Keep artifacts in a safe clean place away from areas where fabrication work is being conducted.

Minimize the amount of touching or handling of artifacts as much as possible, and keep processes that produce dust and gases away from them.

Begin collecting tools that are specifically meant for mount-making, especially those used for measurement.

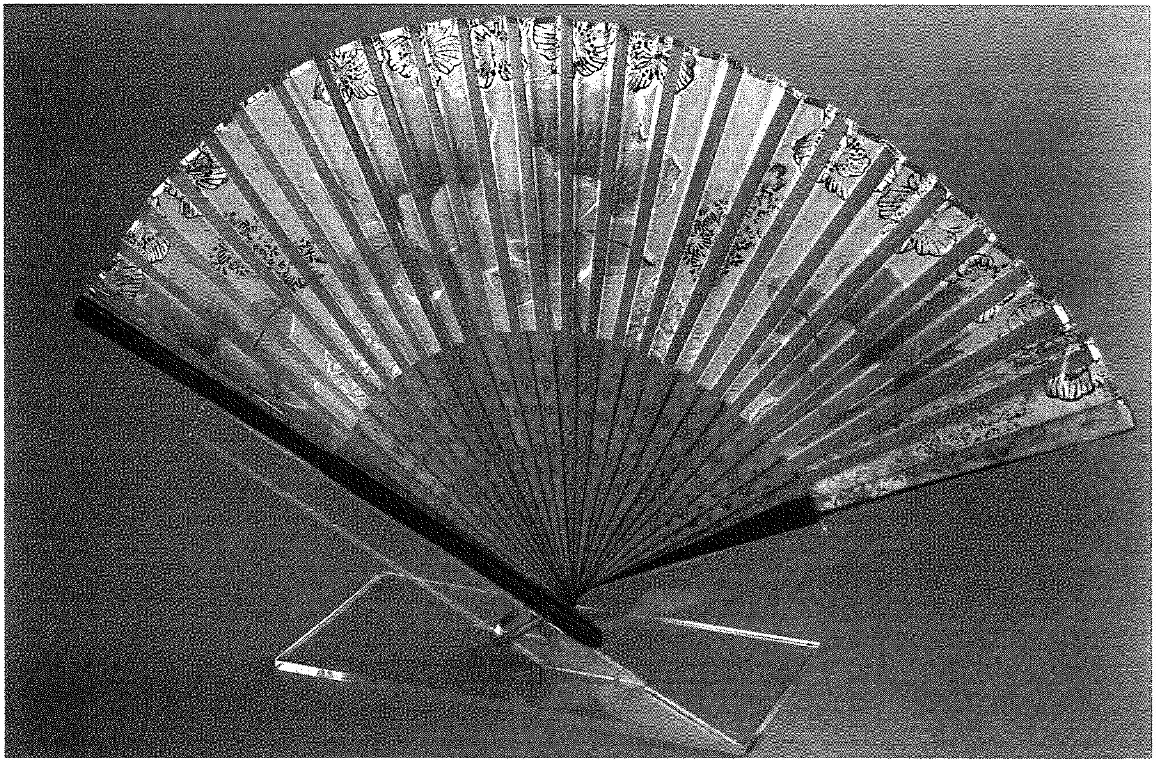
Examples of Mounts

The mounts illustrated and described in the following section were made to solve specific mount-making problems over a period of years. They have been selected to illustrate the wide variety of challenges that safe mounting can present, and also to introduce a range of potentially useful materials and techniques.

We have provided at least one photograph of each object on its finished mount, accompanied by a detailed drawing that illustrates how the mount was made. The text includes a brief description of the object, its display requirements, and the mount — including its overall design features, the materials and tools needed to make it, and its method of construction.

The reader is encouraged to use these examples as a jumping-off point for mount design rather than copy them verbatim. It must be remembered that each object presents a specific problem, and no two solutions will be exactly the same.

Fan



The fan on its mount. This fan is part of the training collection of the Canadian Conservation Institute. The mount was made by Robert Barclay. Photo: Canadian Conservation Institute.

Description

This lightweight paper fan with wood sticks and guardsticks was in excellent condition and could sustain its own weight.

Display requirements

The fan was to be mounted vertically in an open position, so both sides would be visible.

Mount design

The mount consists of two Plexiglas strips that support the weight of the fan along the length of the guardsticks. These strips are wide enough to give strength to the mount but also thin enough to allow insertion of the fan ring. The strips are held to the base with glue, and the joins created are strong enough to support the light weight of the fan. Loosely attached padded monofilament ties secure the fan onto the strips and mount. This type of design (i.e. displaying the fan in a vertical position) is suitable only for fans of sturdy construction in excellent condition.

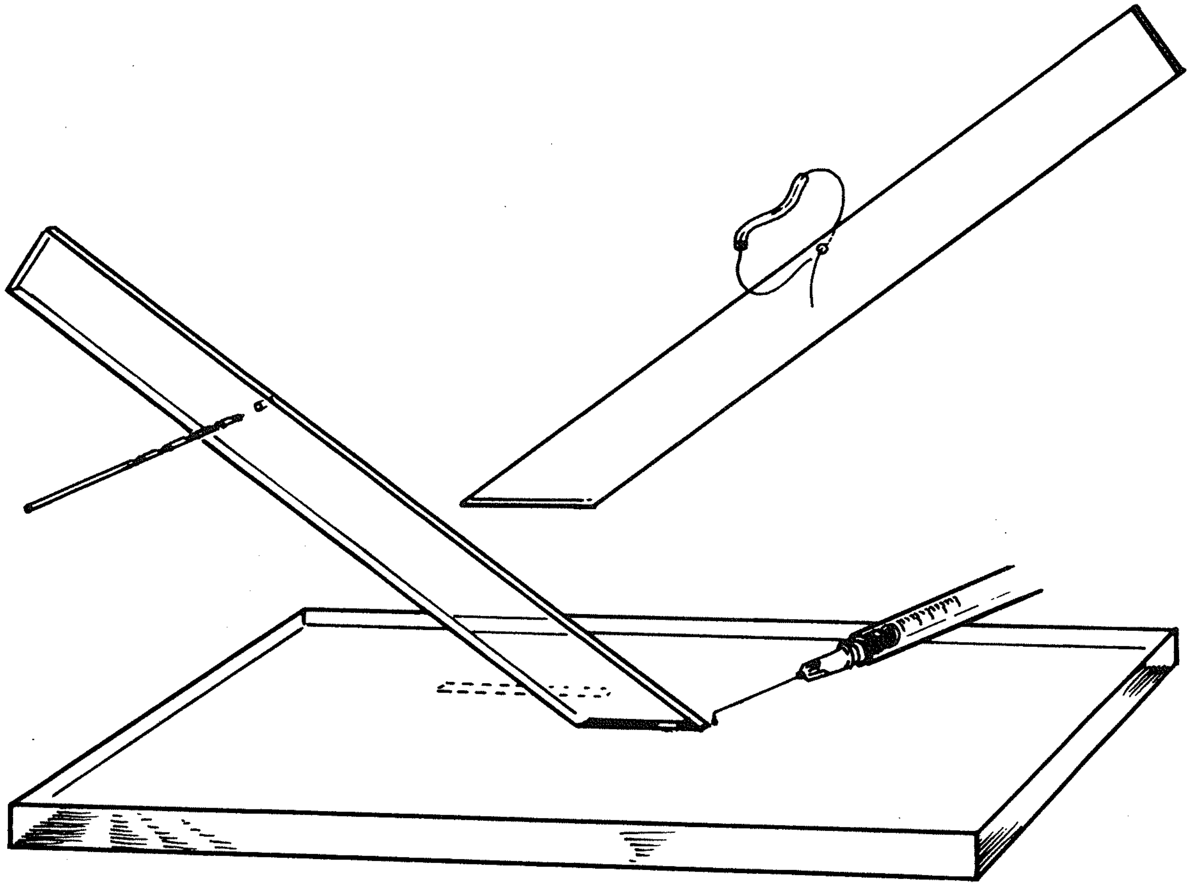
Materials

Plexiglas sheet, 3.2 mm (1/8") thick
Plexiglas sheet, 6.4 mm (1/4") thick
monofilament line
methylene chloride
polyethylene tubing
masking tape

Equipment

Plexiglas cutting and polishing kit*
drill
syringe

* See Appendix



Procedure

- A base of Plexiglas, 6.4 mm (1/4″) thick, was cut to size and the edges were polished.
- The fan was opened to determine the display angle between the two guardsticks.
- Two Plexiglas strips 25.4 mm (1″) wide and 3.2 mm (1/8″) thick were cut to this angle.
- The strips were cut to length and polished.
- A small hole was drilled in the upper part of each strip for attachment of a monofilament supporting line.
- The two strips were positioned on the base so that the fan's guardsticks would fit between their ends, with the end tip of each guardstick resting on the Plexiglas base.
- The strips were temporarily secured to the base with masking tape, and a drop of methylene chloride was applied with a syringe to secure them permanently. Great care was taken to ensure the adhesive went only along the join as a spill on the surface of the Plexiglas would leave an indelible mark. The methylene chloride was allowed to dry for at least 1 hour.
- Polyethylene tubing was threaded over the monofilament line where it contacted the fan.
- The fan was secured to the mount by tying the monofilament line, making sure not to apply too much pressure.

Violin

The back of the violin, showing the mount. This violin is the property of Robert Barclay, and he made the mount. Photo: Canadian Conservation Institute.

Description
The violin was in stable and sound condition, but the finish was delicate and could easily be marred.

Display requirements
The violin was to be mounted so that the front would be visible, and sloped backwards for a comfortable viewing angle.

Mount design
This Plexiglas mount consists of an L-shaped upright base, a padded crosspiece, and a U-shaped bracket. The upright base is reinforced from behind by a brace that prevents it from moving. The violin is supported by the upright base and is held securely in place by the crosspiece (which springs gently into place and grips the violin body across its narrowest point) and the U-shaped bracket (which is located by its tailpeg). To ensure the mount and violin are stable, two holes in the base allow the mount to be fixed to a display case with screws.

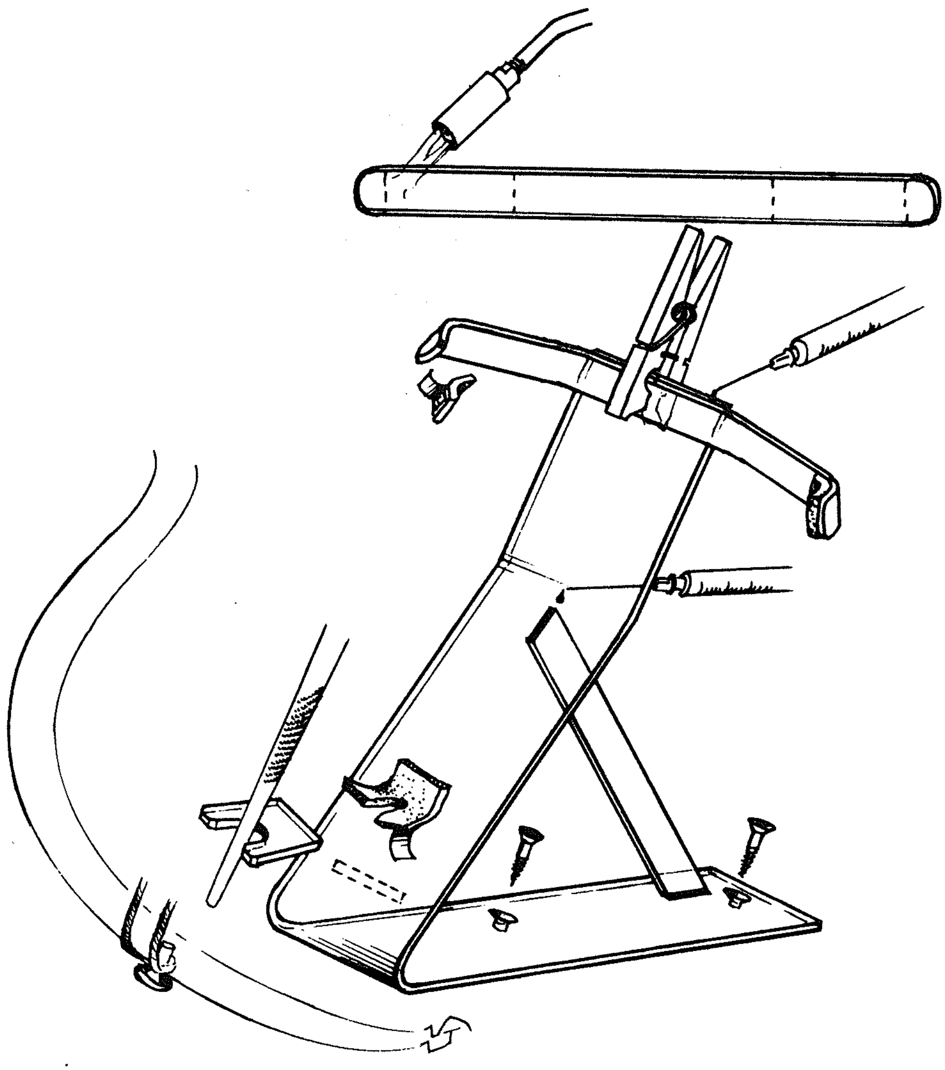
Materials
Plexiglas sheet, 3.2 mm (1/8″) thick
cross-linked polyethylene foam
double-sided tape
methylene chloride
masking tape
matboard

Equipment
Plexiglas cutting and polishing kit*
syringe
drill
countersink
clothespin
torch
hot-wire bender

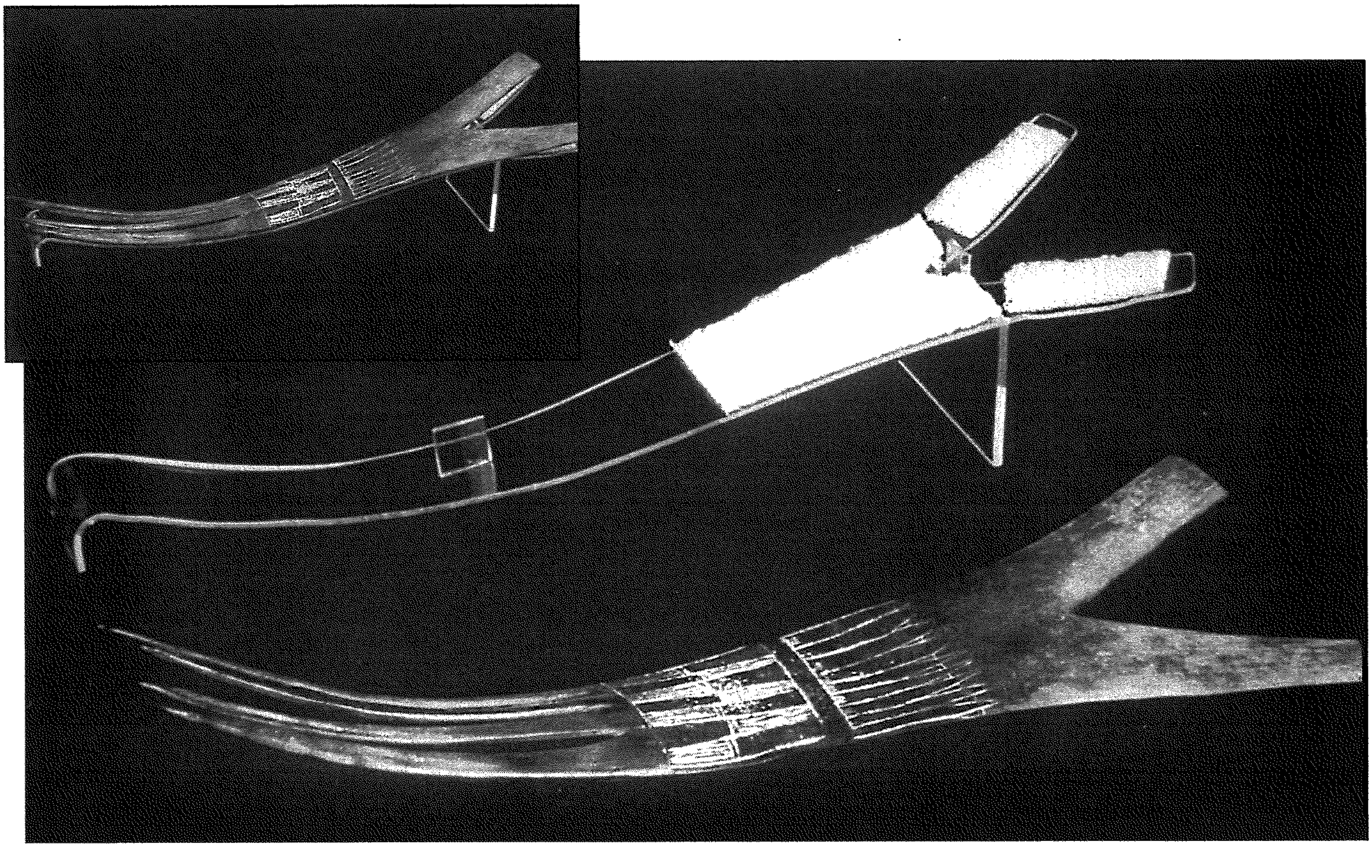
*See Appendix

Procedure

- A strip of Plexiglas, about 50.8 mm (2″) wide, was cut to length to make the L-shaped base. The edges were polished.
- Two attachment holes were drilled and countersunk into the base.
- The strip was heated with a hot-wire bender (as illustrated for the archaeological pipes on p. 67) and bent to shape using a matboard template that correctly reproduced the profile of the violin.
- A crosspiece was cut to such a length that, when bent and with the foam padding in place at each tip, it could spring gently into place and grip the violin body across its narrowest point. The tips and the middle section were heated with a torch and bent to shape.
- Polyethylene foam padding was adhered with double-sided tape to the points of the crosspiece that would contact the violin. Final adjustments were made to bends so that the crosspiece gripped the violin securely but not too tightly.
- The crosspiece was adhered to the upright piece with methylene chloride applied with a syringe. A clothespin provided gentle pressure during gluing.
- A reinforcing brace was cut from Plexiglas, polished, and adhered to the back of the base. It was positioned correctly using masking tape, then attached permanently with methylene chloride.
- A U-shaped bracket that would support the violin tailpeg was made from Plexiglas and finished by polishing.
- The bracket was adhered with methylene chloride to the bottom of the upright.
- Polyethylene foam was attached to the bracket using double-sided tape.



Antler Comb



The antler comb beside its mount and (inset) on the mount. This comb is part of the collection of the London Museum of Archaeology, London, Ontario, Accession No. JO1966. The mount was made at the Canadian Conservation Institute. Photos: Canadian Conservation Institute.

Description

This antler comb exhibited the natural curve of the antler. The material was tough and durable, but the surface was subject to abrasion. The four long and thin comb tines were fragile.

Display requirements

The comb was to be displayed horizontally on the base of a waist-high display case.

Mount design

The mount consists of a flat sheet of Plexiglas that is cut and shaped to conform to the curve of the antler, a back foot that raises the mount slightly for better viewing, and a Plexiglas wedge that is positioned between the middle tines of the antler comb to ensure the comb cannot slip down or topple off sideways. This design provides full yet unobtrusive support for the whole surface of the object. Padding provides cushioning and further secures the object through friction.

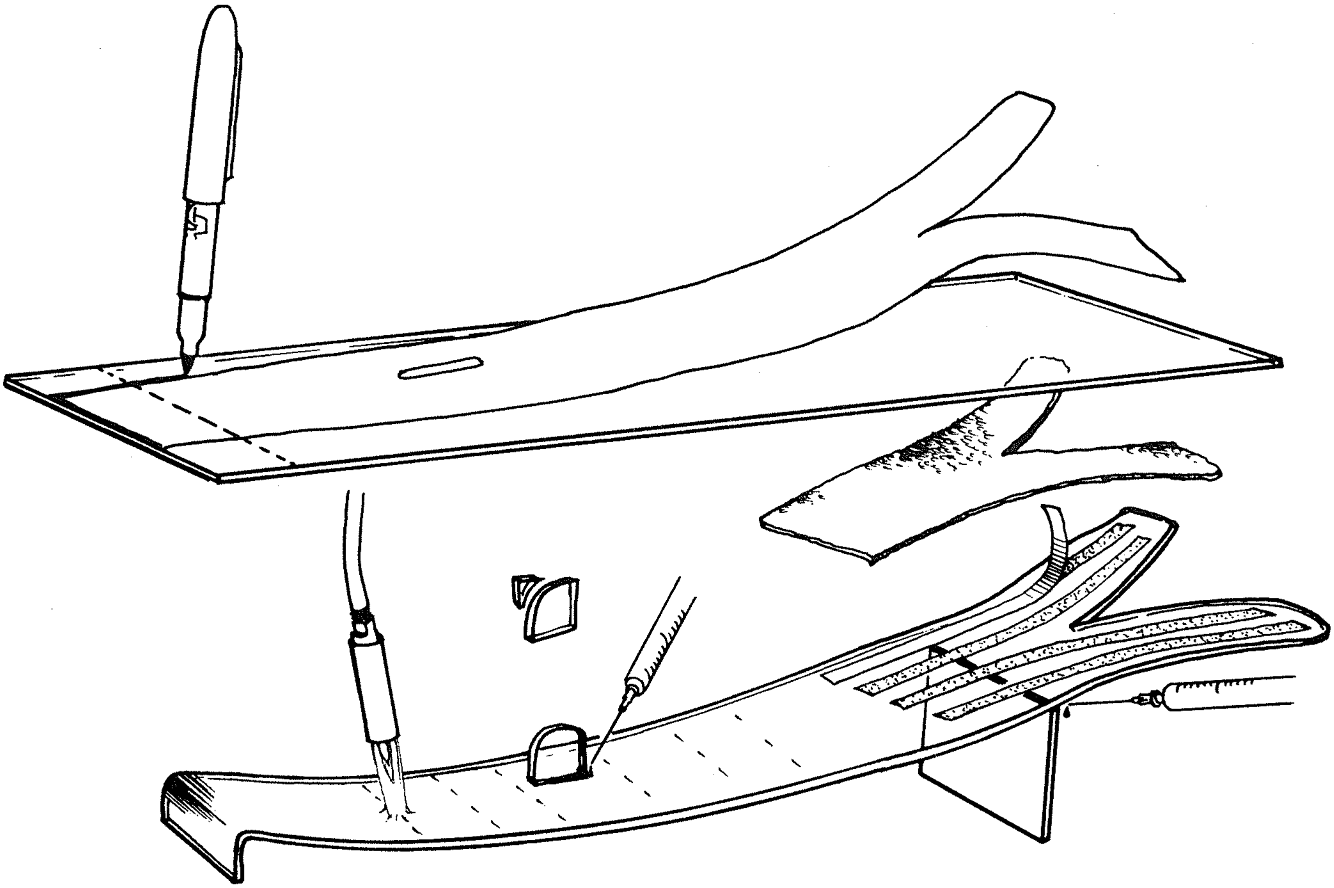
Materials

double-sided tape
felt
Plexiglas sheet, 3.2 mm (1/8") thick
methylene chloride
cardboard

Equipment

Plexiglas cutting and polishing kit*
propane torch
scissors
syringe

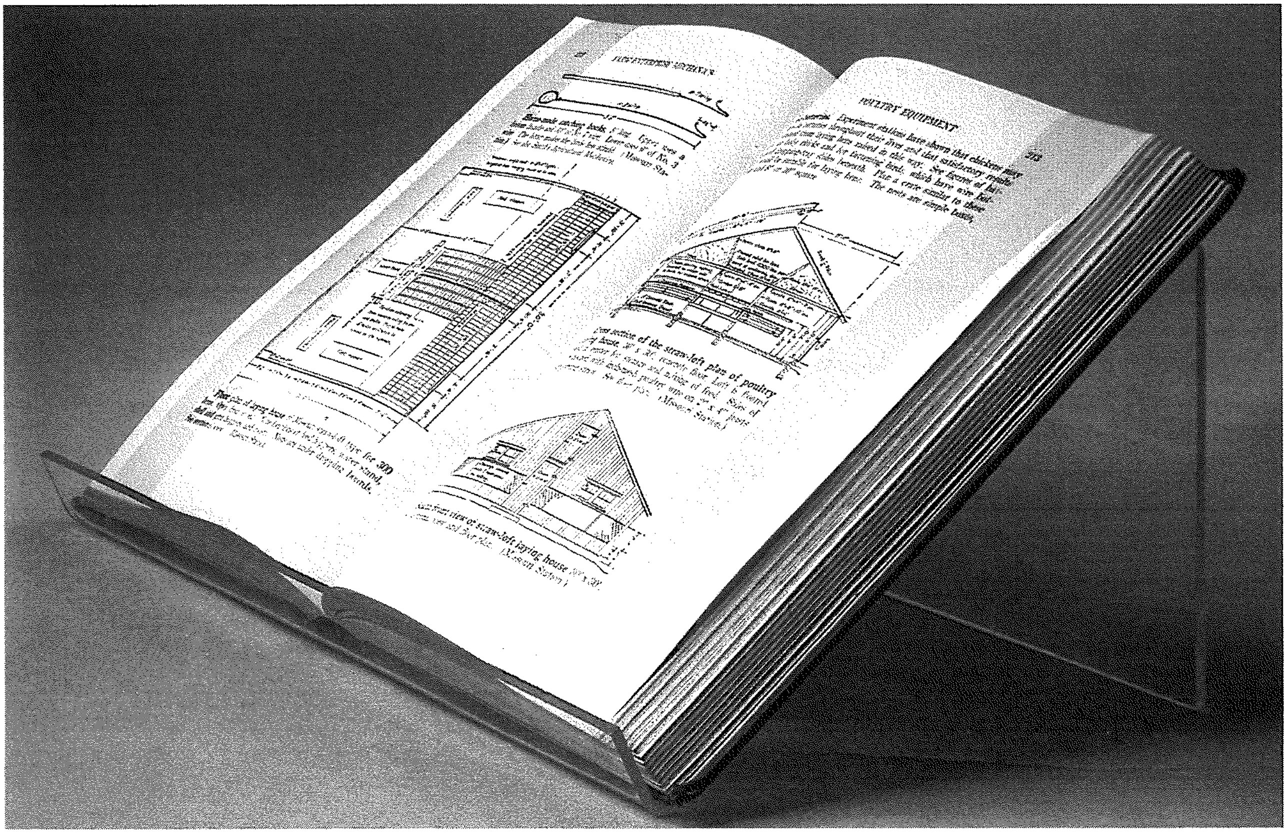
*See Appendix



Procedure

- A piece of Plexiglas was cut to size and polished.
- The Plexiglas was heated with a propane torch and bent to form the front foot, then bent in the centre to create a smooth curve that conformed to the shape of the comb. The shape of the Plexiglas was checked with a cardboard profile template that had been cut to match the underside curve of the comb.
- A small Plexiglas wedge was cut, filed, and polished. It was positioned on the mount so that it fit between the two middle tines when the comb was resting on the mount, then adhered with methylene chloride applied with a syringe.
- The back foot of the mount was cut from Plexiglas and polished, then adhered with methylene chloride.
- The mount was padded with felt attached with double-sided tape.

Book



Book on its mount. This book is the property of George Prytulak. The mount was made at the Canadian Conservation Institute. Photo: Canadian Conservation Institute.

Description
This book had a traditional binding in good condition.

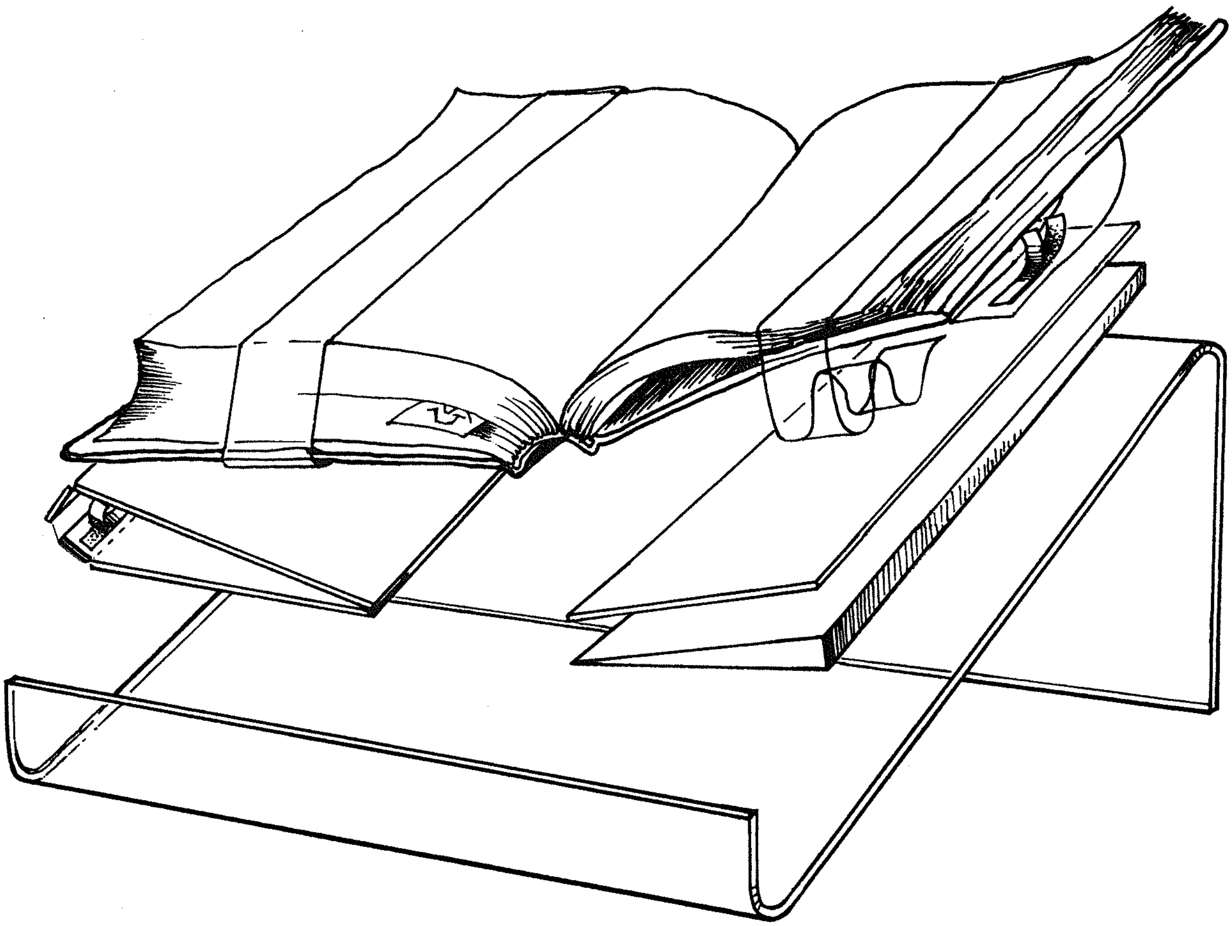
Display requirements
The book was to be mounted open at a particular page, but still allowing the pages to be turned without too much effort.

Mount design
The mount consists of a single sheet of Plexiglas that is bent to avoid a glued join. The angle of the bend at the back of the mount determines the viewing angle. (A steep angle provides for easy viewing, but the steeper the angle the greater the proportion of the book's weight that falls onto the bottom ledge of the mount.) The angle chosen here is shallow enough to avoid distortion and spine damage from the weight of the text block pulling at the spine. Wedges are added between the book and the mount to support the spine. Strips of Mylar secure the text block open at the required page. They are fitted loosely to avoid damaging the edges of the pages.

Materials
Plexiglas sheet, 3.2 mm ($^{1}/_{8}$") thick
double-sided tape
acid-free matboard
Mylar
polyethylene foam

Equipment
Plexiglas cutting and polishing kit*
hot-wire bender
utility knife
scissors

*See Appendix



Procedure

- A piece of Plexiglas slightly larger than the open book, and with an appropriate length to allow the lip and back bend, was cut, polished, and bent into shape using a hot-wire bender (as illustrated for the archaeological pipes on p. 67).
- Mylar was cut into strips of sufficient width, and the ends of the strips were secured with double-sided tape to create loops.
- To support the spine of the book, two wedge-shaped inserts were inserted underneath the book and secured with double-sided tape. These types of inserts can be made using either folded acid-free matboard (left side of illustration) or polyethylene foam covered with matboard attached with double-sided tape (right side).

Glove

Description

This very narrow glove, made of thin leather, was in good condition and relatively robust. It was flexible and required internal support to prevent creasing.

Display requirements

The glove was to be displayed with the fingers pointing upwards and the hand open, and the mount was to stand upright from the base of a display case.

Mount design

The mount consists of a Plexiglas base that holds a glove-shaped padded internal support. The internal support is strengthened with wooden sticks inside the fingers and the thumb and matboard inside the palm, and the base has screw holes so the mount can be secured to a display case. When designing internal supports such as this one, it is important to ensure that the object will not be stressed as the support is slipped into place. For this reason, the fingers of this mount do not span an area wider than the palm, and the thumb support is separate so that it can be inserted after the rest of the mount is slipped inside the glove. However, this means that the weight of the thumb support is carried only by the glove itself. If the glove had not been robust enough to carry this weight, the thumb support would have to have been riveted or tied to the Plexiglas base.

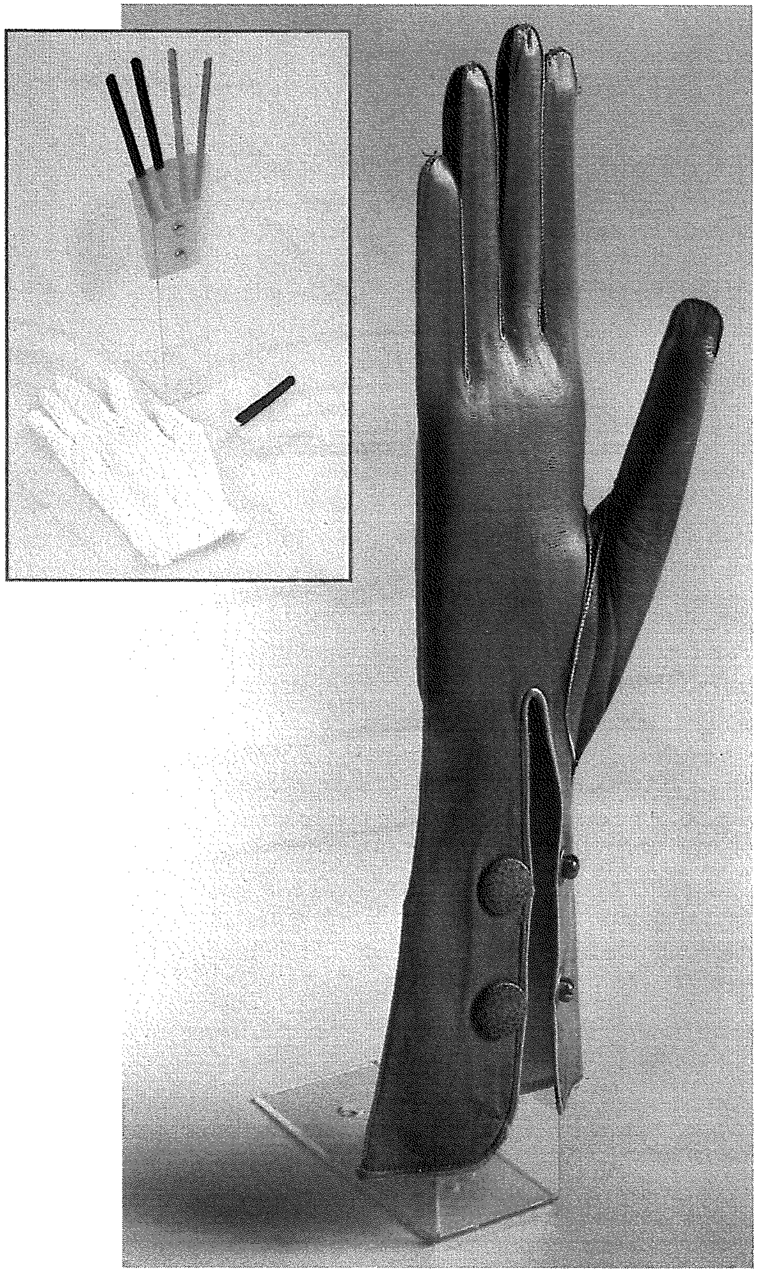
Materials

Plexiglas sheet, 3.2 mm (1/8″) thick
acid-free matboard, 4 or 8 ply
flat wooden sticks
polyester quilt batting
white cotton glove, pre-washed
Deccofelt
plastic screws, brass rivets, or twill tape
double-sided tape

Equipment

Plexiglas cutting and polishing kit*
drill
hole punch
scissors
utility knife
hot-melt glue gun

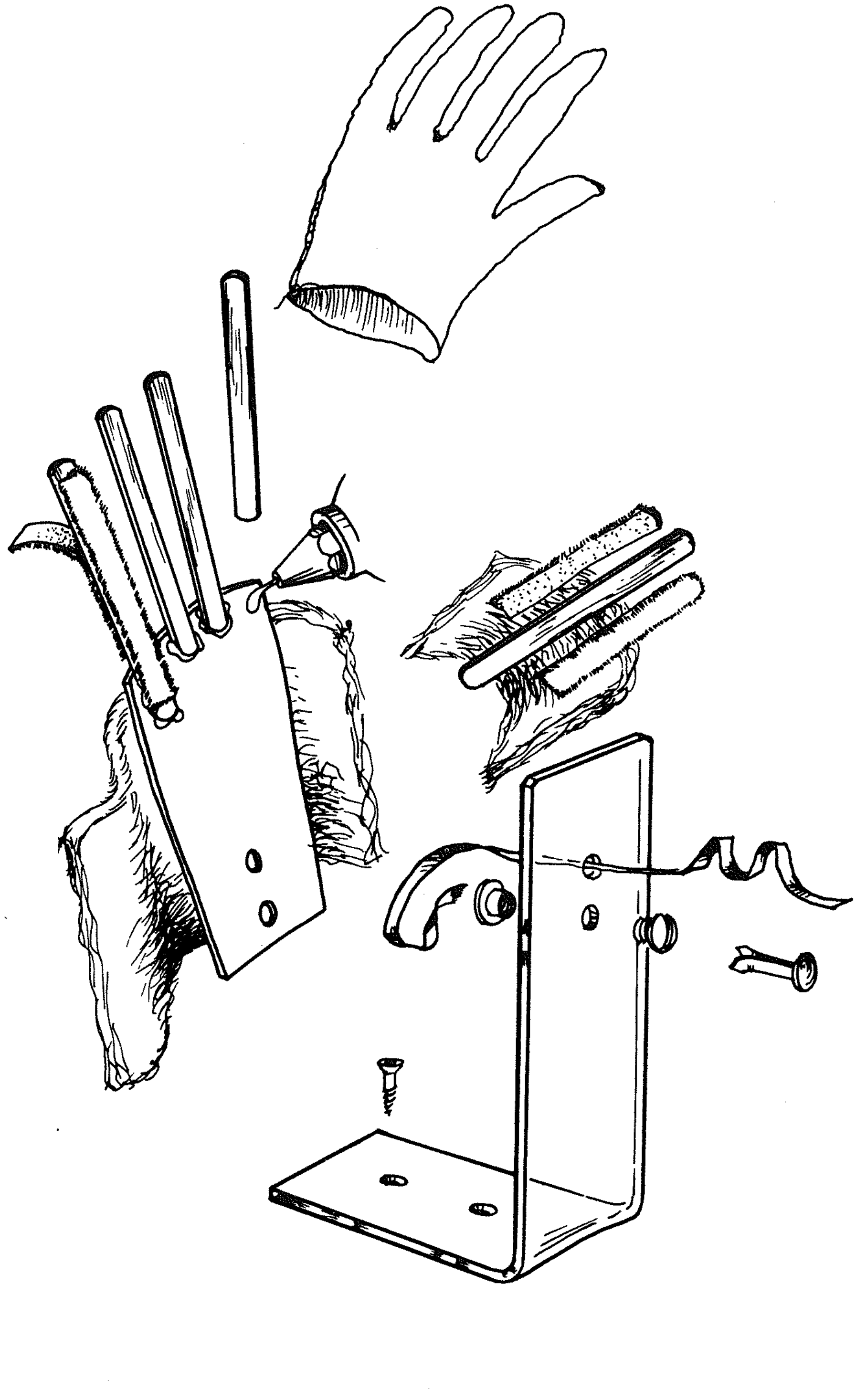
*See Appendix



The glove on its mount. (Inset) The mount during fabrication (replica). This glove is part of the training collection of the Canadian Conservation Institute. The mount was made by Robert Barclay. Photos: Canadian Conservation Institute.

Procedure

- A matboard form was cut to fit the palm of the glove. It had to be considerably smaller than the glove to allow for padding, and to make sure it could be inserted into the glove without stress.
- The matboard was padded with polyester quilt batting, secured with double-sided tape.
- Two holes were punched near the wrist end of the matboard.
- Finger supports were made with thin flat wooden sticks cut to the appropriate length.
- Deccofelt was attached to pad the fingers.
- The sticks were attached to the matboard palm support using hot-melt glue.
- A thumb support (similar to the finger supports) was made, and polyester quilt batting was added to the base area. (The thumb support was not adhered to the matboard base as this would have made it very difficult to put the glove onto its support.)
- The floating thumb support was inserted into a white cotton glove, followed by the finger/palm unit.
- The leather glove was slipped over the white glove, and extra padding was added to the palm as required.
- A strip of thin Plexiglas (or Lexan) was used to mount the glove. Two holes were drilled to attach the hand mount to this base. (The diagram shows three possible methods of attachment: plastic screws, brass rivets, or twill tape.)
- Two holes were drilled at the bottom of the Plexiglas strip so the mount could be secured to the display case.



Busby

Busby on its mount. This busby is part of the collection of the Prince Edward Island Museums and Heritage Foundation, Accession No. HF.90.21.1 A-C. The mount was made by Deborah Stewart and Robert Barclay at the Canadian Conservation Institute. Photo: Canadian Conservation Institute.

Description

The fur skin of this busby was dry and stiff with numerous holes and tears. Much of the original stitching was missing, particularly on the chin strap.

Display requirements

The busby was to be mounted in the position in which it would have been worn. It required an internal support to prevent it from becoming deformed.

Mount design

The mount consists of a padded and fabric-covered block of polyethylene foam that conforms to the hat's inner shape, two Plexiglas rods of a sufficiently large diameter to support the foam, and a Plexiglas base that is wider than the busby. The chin strap is held secure with a Lexan strip and padded monofilament line. Lexan was chosen because it can be easily bent to a smooth, even curve without heat. This design provides all-around support for the shape and weight of the hat. The wide base ensures stability and prevents other objects from being placed too close to the busby.

Materials

Plexiglas sheet, 6.4 mm (1/4") thick
Plexiglas rod, 12.7 mm (1/2") in diameter
Lexan
monofilament line
polyethylene foam block
polyester quilt batting
jersey knit fabric
polyethylene tubing
methylene chloride

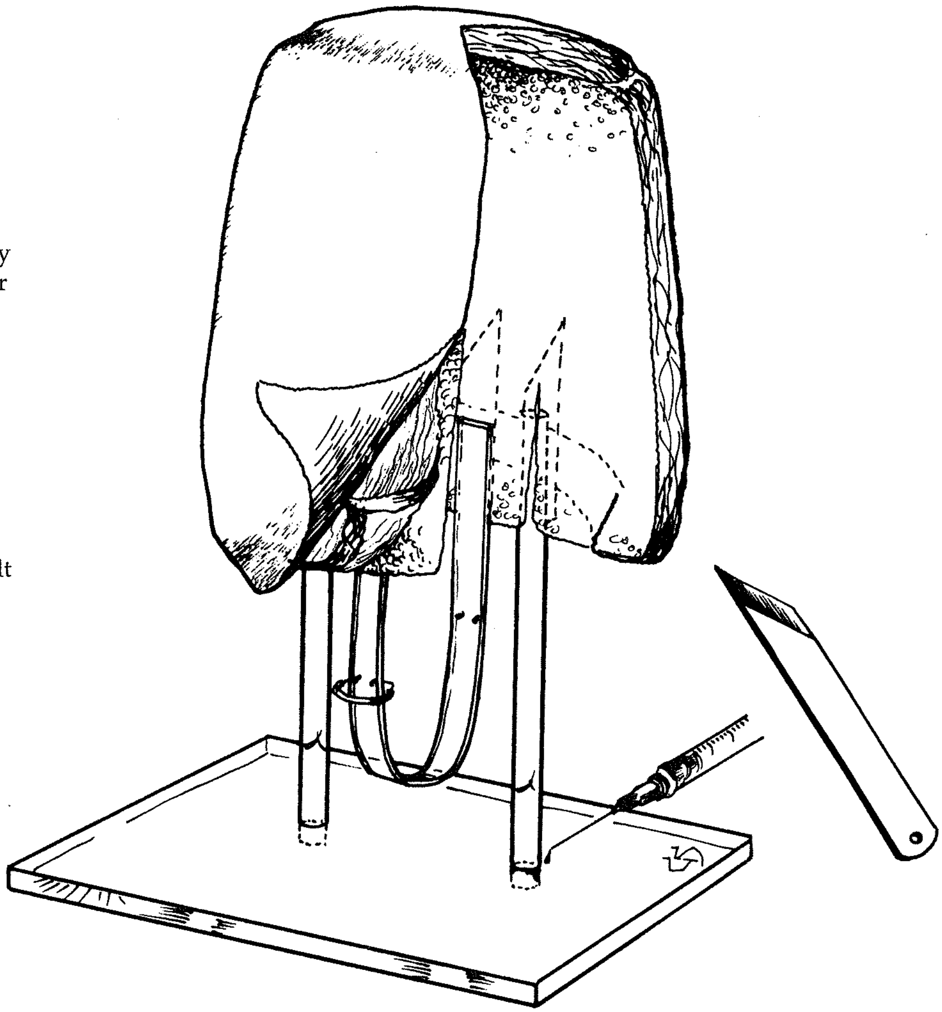
Equipment

Plexiglas cutting and polishing kit*
syringe
drill
file
scissors
pointed blade
hot-melt glue gun
flat wooden stick
utility knife

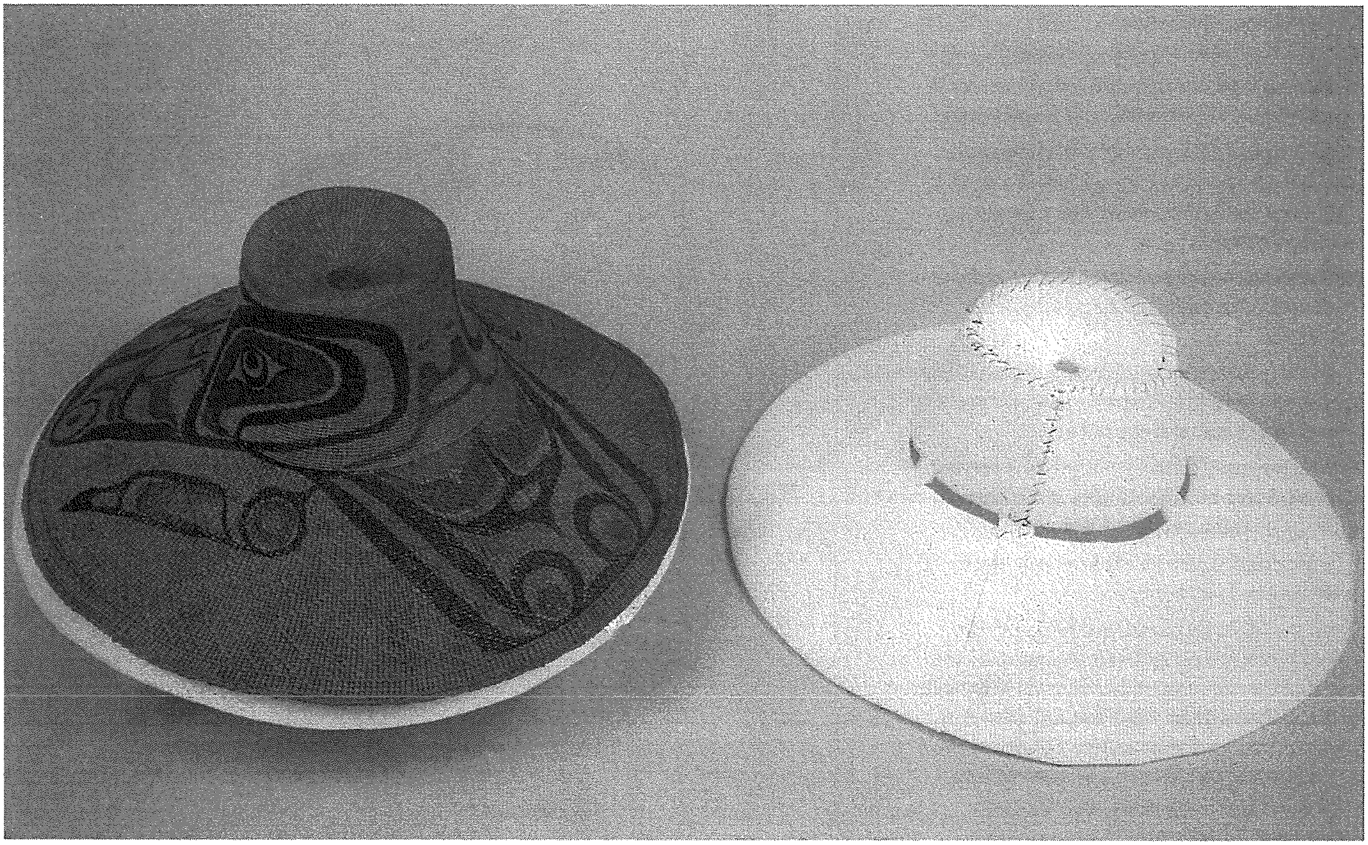
*See Appendix

Procedure

- A rectangular base was cut from Plexiglas and polished.
- The ends of two Plexiglas dowels were filed to a point to make them easier to insert into the polyethylene foam block.
- Two holes, 12.7 mm (1/2") in diameter, were drilled in the Plexiglas base, and the flat polished ends of the dowels were inserted.
- The dowels were adhered with a drop of methylene chloride applied with a syringe.
- The foam block was carved with a utility knife to a size and shape slightly smaller than the inside of the busby.
- Polyester quilt batting was laid over the carved foam block to make it conform exactly to the interior of the busby.
- The padded foam block was covered with jersey knit fabric.
- An incision was cut at the base of the foam block using either a pointed blade or utility knife, and the edges of the quilt batting and fabric were tucked into the incision using a sharpened flat wooden stick (for a more thorough description of this technique see the mount for the lace collar on p. 49).
- The covered foam support was placed onto the rods of the Plexiglas base and its height was adjusted.
- A strip of Lexan slightly wider and longer than the chin strap was cut and polished.
- Both ends of the strip were cut to points so that they could be inserted at least 50.8 mm (2") into the covered foam inner support.
- To secure the chin strap against the Lexan support strip, pairs of small holes were drilled through the Lexan strip to allow attachment of monofilament line covered with polyethylene tubing.
- The strip was curved and inserted into the foam; it was attached to the foam with dabs of hot-melt adhesive.



Haida Hat



Haida hat on its mount, beside a similar hat mount. This hat is part of the collection of the McCord Museum of Canadian History, Montreal, Accession No. ME932.3. The mounts were made by France Rémillard, Centre de conservation du Québec. Photo: Michel Élie, Centre de conservation du Québec.

Description

This hat was in good condition but the material was flexible, relatively fragile, easily deformed, and torn in some areas.

Display requirements

The hat was to be displayed in a horizontal position, or at a slight angle.

Mount design

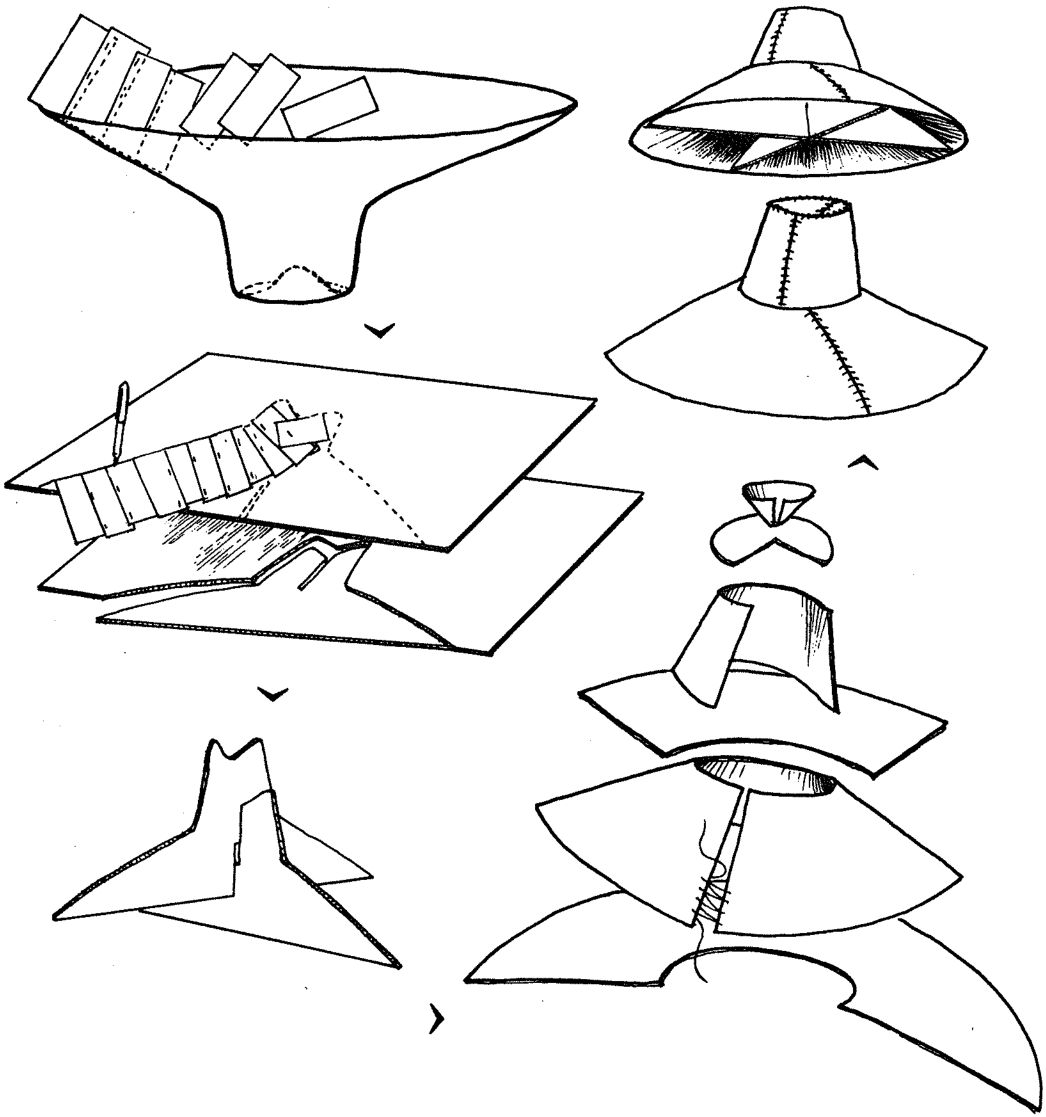
The mount has a cross-shaped support matrix made of fluted polyethylene sheet that provides strength and shape. On this matrix are three pieces of foam that have been stitched to themselves to form conic segments, and then stitched to each other to build up the form of the hat. The foam provides a cushioned support for the entire inner surface of the hat.

Materials

fluted polyethylene sheet, 6.4 mm (1/4")
two-ply matboard
thread
staples
adhesive tape
kraft paper
Nalgene sheet, 6.4 mm (1/4")

Equipment

stapler
scissors
pencil
utility knife
sewing needle
hot-melt glue gun



Procedure

- A template of the profile of the inside of the hat was developed using small pieces of matboard, cut to shape and stapled together; this template was then traced with pencil onto fluted polyethylene sheet and cut out with a utility knife.
- A second profile of the hat, at 90° from the first one, was created in the same manner.
- Interlocking grooves were cut to create a cross-shaped support matrix from the two fluted sheet profiles.
- The interior of the hat was gradually lined with kraft paper to establish the correct curvature of the Nalgene sheet lining that was to cover the support matrix. The paper was cut and taped so that it followed perfectly the inside curvature of the hat. Three different curvatures were required, so three paper templates were made. The resulting curved paper templates were traced onto the foam and cut out. The three conic segments were joined using sewing thread.
- The foam lining was secured onto the fluted polyethylene support matrix with little dabs of hot-melt glue.

Purse

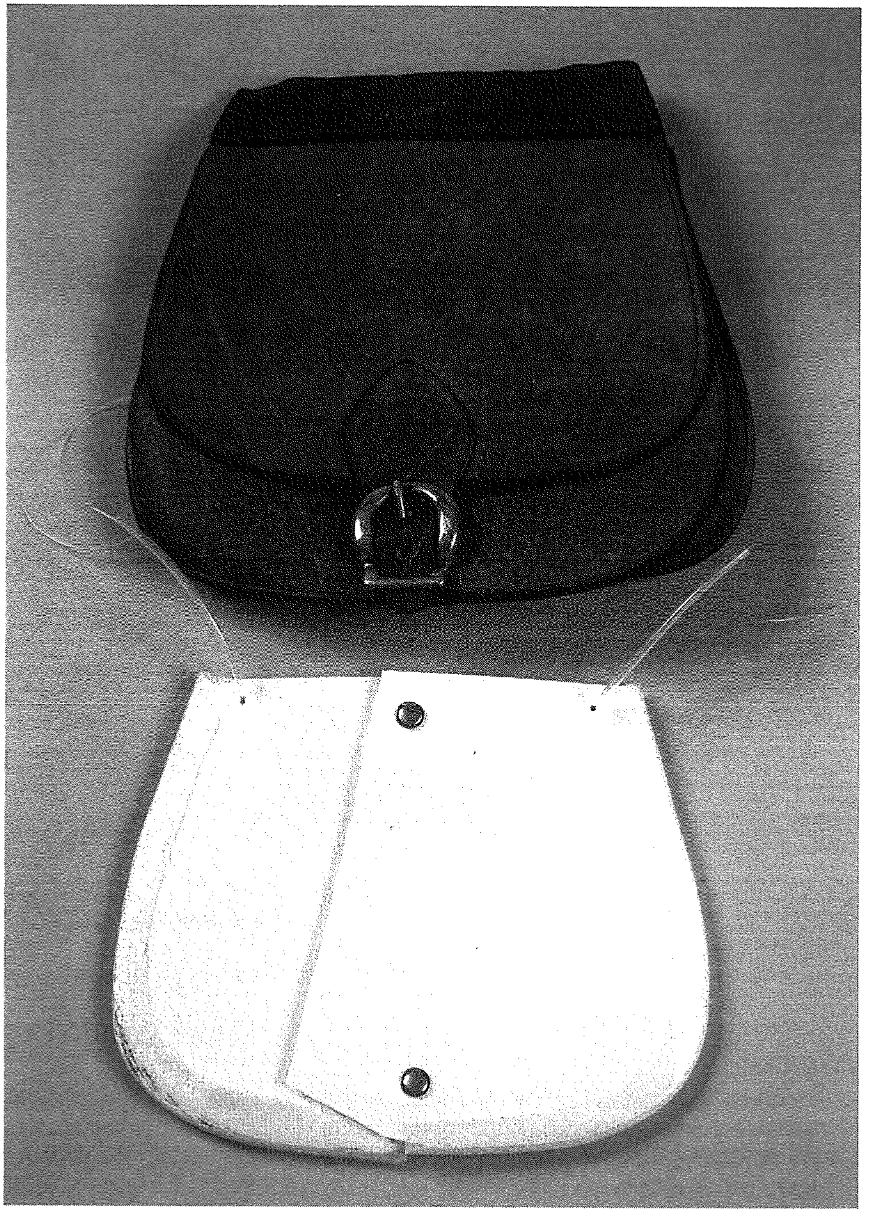
Description
This leather purse was in excellent, stable condition, and its components and stitches were strong.

Display requirements
The purse was to be closed and displayed in a vertical position, mounted on the back of the display case.

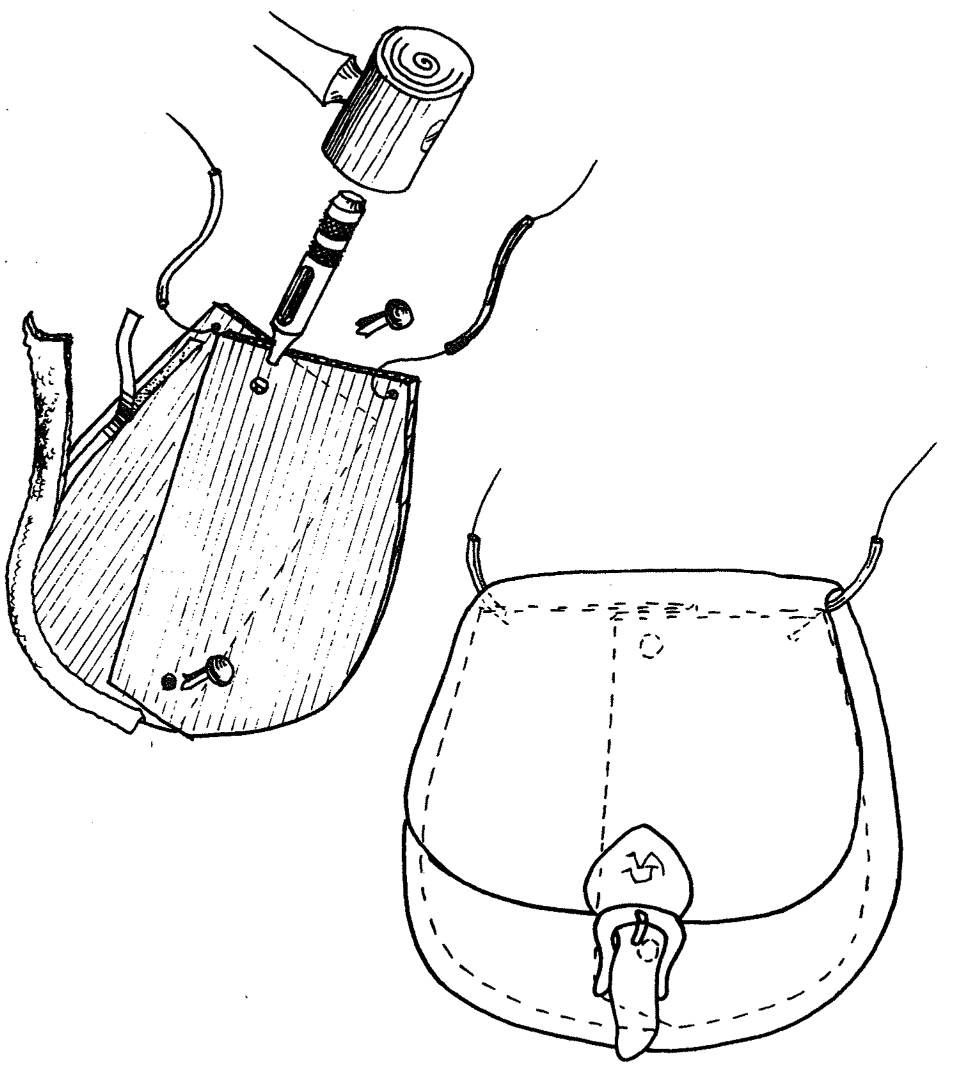
Mount design
The mount consists of a rigid internal support that follows the inner contours of the purse and provides volume. Because the opening of the purse is narrower than the bottom, it is not possible to insert a fully-contoured rigid mount directly through the opening. The inner support therefore consists of two smaller, movable parts. These are collapsed as they are inserted, and then opened and positioned inside the purse and rivetted in place. Monofilament thread padded with tubing is used to suspend the object in the display case.

Materials
fluted polyethylene sheet
brass rivets (Bildemup)
polyethylene foam sheet
double-sided tape
monofilament line
polyethylene tubing

Equipment
utility knife
hole punch
hammer
drill
scissors



The purse (top) and the mount. This purse is part of the training collection of the Canadian Conservation Institute. The mount was made by Robert Barclay. Photo: Canadian Conservation Institute.



Procedure

- Two pieces of fluted polyethylene sheet were cut to shape with a utility knife. The pieces were narrow enough that they could be placed inside the purse without stressing it.
- The cut edges were padded with thin polyethylene foam sheet, attached with double-sided tape.
- Holes were punched in the fluted sheet to take the brass rivets. The bottom rivet was inserted and acted as a hinge.
- Small holes were drilled in the top corners of the mount to allow insertion of a monofilament line.
- The line was covered with polyethylene tubing where it would come in contact with the purse.
- The two pieces were collapsed by means of the rivet hinge, and inserted into the purse.
- Once inserted in the purse, the two pieces of fluted sheet were spread apart and the top rivet was inserted to secure them in position.
- Both ends of the brass rivets were covered with thin foam sheet to avoid direct contact between the metal and the inside of the purse.

Lace Collar

Description

This piece of lace was in good condition, but it was inherently delicate and folded easily under its own weight.

Display requirements

The lace was to be draped in a way that would replicate its appearance when being worn, while still being spread out to reveal the design.

Mount design

The mount consists of a velvet-covered foam ring for the neck of the collar, and a velvet-covered angled piece of matboard for the chest piece. The angled matboard rests along the full length of its base, and is held upright with a wood dowel. This section is further supported with a matboard cross-brace that is hinged onto the dowel and reinforced with matboard triangles where it joins the angled matboard, making the mount very stable. The neck piece of the collar is held onto the foam support with pins, but friction alone is sufficient to secure the lightweight chest piece to the velvet-covered matboard support.

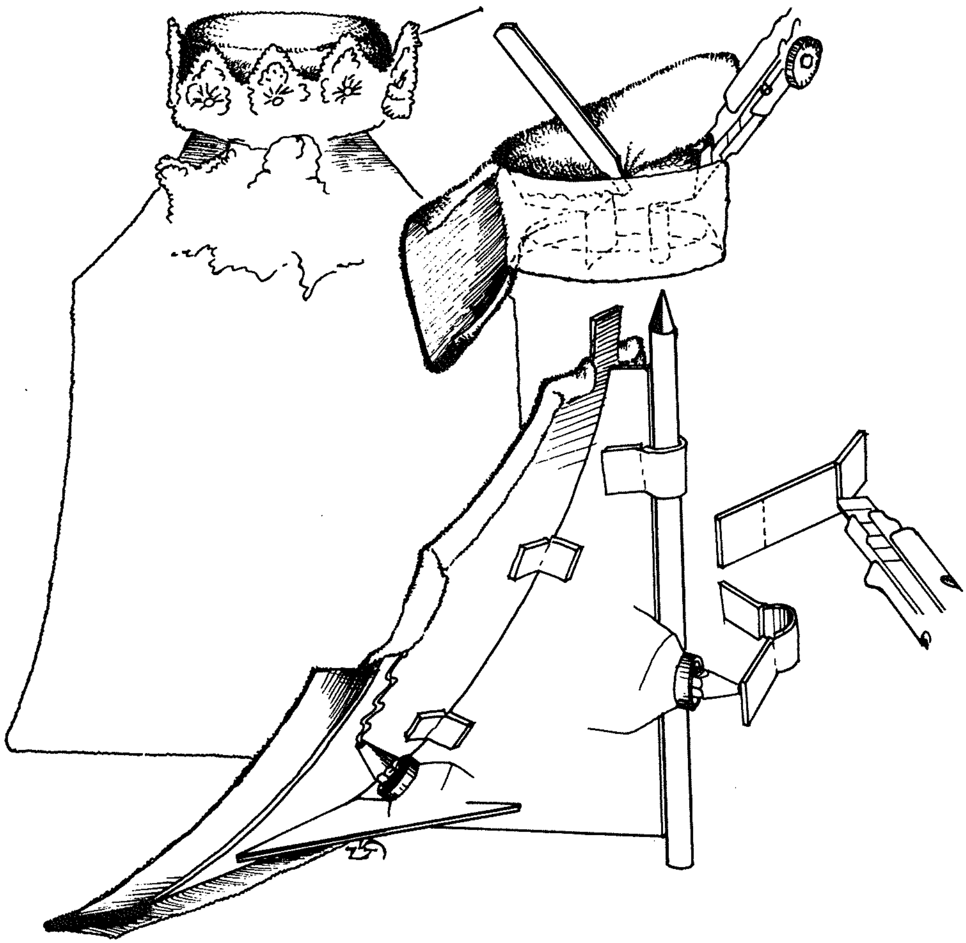
Materials

acid-free matboard, 4-ply
wood dowel, 9.5 mm (3/8") in diameter
polyethylene foam plank
velvet fabric

Equipment

utility knife
hot-melt glue gun
flat wooden stick
stainless steel pins
scissors

The collar on its mount. This collar belongs to the Machin Collection, Lake of the Woods Museum, Kenora, Ontario. The mount was made by Barbara Spague, formerly of the Lake of the Woods Museum. Photo: Canadian Conservation Institute.



Procedure

- A piece of matboard was cut to size and curved to make the support for the chest section of the lace.
- A second piece of matboard was cut to make a vertical back support for the chest piece.
- A wood dowel, sharpened at the top end with a utility knife, was used to strengthen the vertical back support and to join this part of the mount to the foam ring for the collar.
- The vertical back support was attached to the dowel and the front chest section (at 90°) with matboard tabs adhered with hot-melt glue.
- The chest section was further reinforced at its base with triangular pieces of matboard, also attached with tabs.
- The front of the matboard chest support was covered with velvet, secured to the back of the board with hot-melt glue.
- The collar support section was carved out of polyethylene foam with a utility knife, and a slot and a hole were cut in the bottom so that the matboard chest section and the wood dowel could be inserted.
- Circular incisions were also cut in the foam cylinder around the top and bottom peripheries at a 45° angle to grip the velvet covering.
- Two pieces of velvet, one circular and one rectangular, were cut with scissors. A sharpened flat wooden stick was used to push the edges of the fabric into the circular incisions; this gave a neat appearance to the fabric, avoided the use of glue, and was faster than stitching.
- The lace neck piece was pinned to the foam support using stainless steel pins, taking care that the pins did not pass through the lace thread.

"Sailor with Two Companions"

"Sailor with Two Companions" by Alma Baldwin, on its mount. (Inset) The mount alone (replica). This object is part of the collection of the Canadian Museum of Civilization, Hull, Quebec, Accession Nos. 78-58, 78-59, 78-60. Main photo: Canadian Museum of Civilization. Inset photo: Canadian Conservation Institute.

Description

This object comprised three stuffed fabric figurines that were soft, lightweight, flexible, and in sound condition. The three figurines were securely stitched together at the back, where the arms and hands of the sailor meet the body of the two other figurines.

Display requirements

The three figures were to be mounted in a natural position, slightly angled to suggest a joyful and not-very-sober condition; the support was to be inconspicuous from the front.

Mount design

The mount consists of a T-shaped wire extending upward from a block of wood. The block of wood supports most of the weight of the three figurines, as if they were sitting down on it. The upper arms of the T-shaped wire are bent into a U-shape, and then slipped under the armpits of the central figurine to hold the three figurines upright and secure them to the mount.

Materials

brass wire
masking tape
polyethylene tubing
wood block
Option a - acrylic or vinyl acrylic exterior-grade latex varnish
Option b - Marvelseal, fabric, and double-sided tape

Equipment

Soldering kit* (using propane torch and hard solder)
scissors
drill
pliers
saw
Option a - paintbrush
Option b - tacking iron

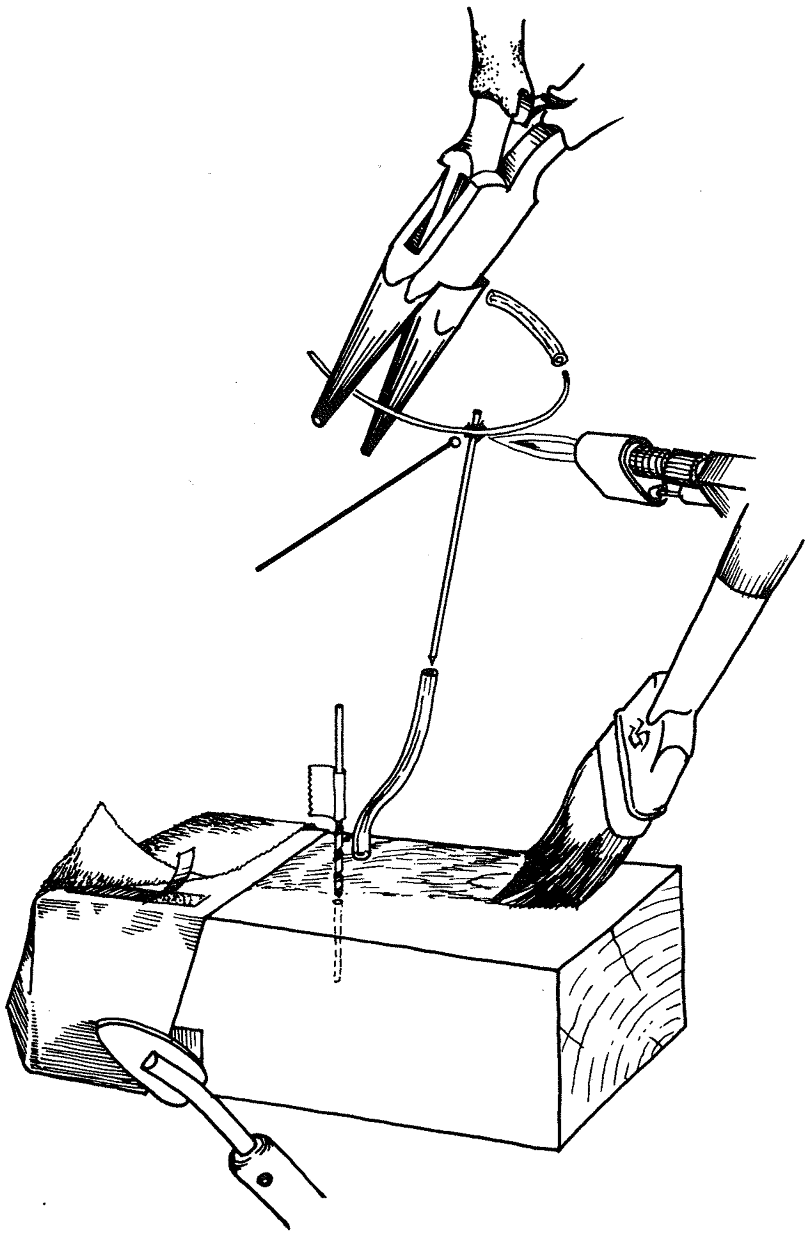
*See Appendix

Procedure

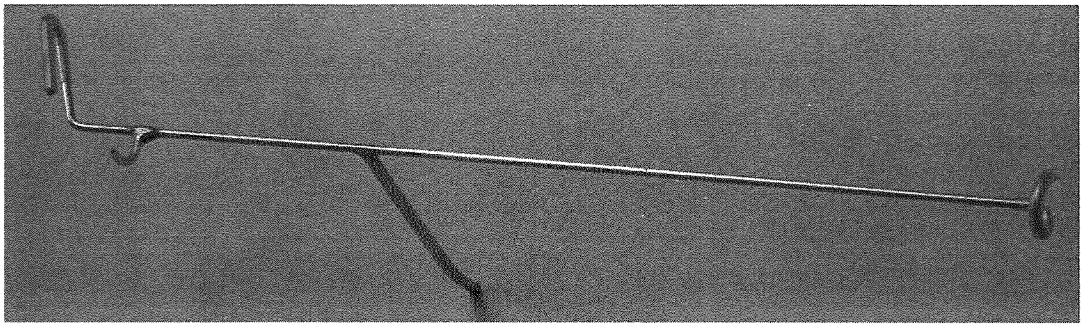
- A brass wire was cut to length and bent with pliers to a U-shape to support the back and armpits of the central figure.
- The U-shaped wire was hard soldered to a straight piece of wire using a torch. Flux residues were cleaned off by scrubbing with hot water.
- Polyethylene tubing was applied to the wire to provide padding where it wrapped around or touched the figure.
- A hole was drilled in the block of wood to insert the bottom end of the wire.
- The block of wood was cut to size, and isolated from the fabric figures. The illustration shows two possible methods to accomplish this isolation.

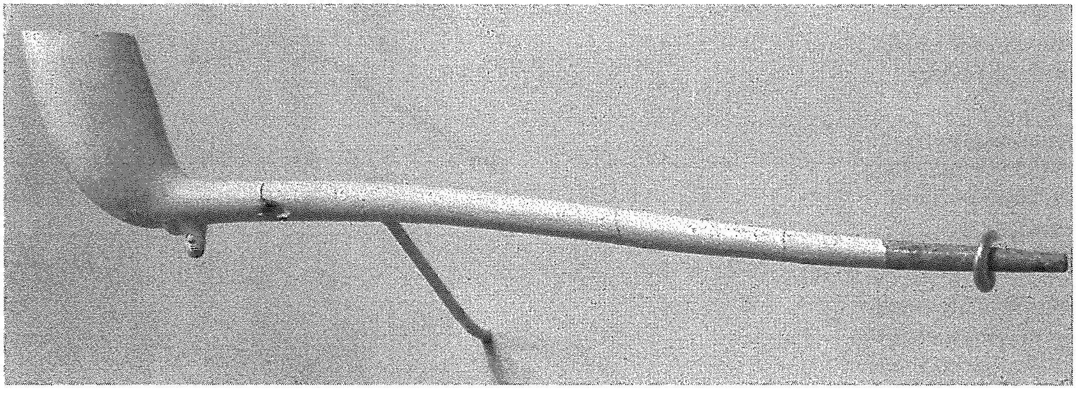
Option a (on the right) - Three coats of varnish. This requires 4 weeks of airing out before the object can be placed onto the coated block. The main advantage of this method is that the grain of the wood remains visible. Acrylic or vinyl acrylic exterior-grade latex paints can also be used in the same manner.

Option b (on the left) - Marvelseal. The wood is completely sealed with Marvelseal, attached with a hot tacking iron. For aesthetic purposes, the Marvelseal is covered with fabric adhered with double-sided tape. This method is safer and faster than using varnish.



Terra Cotta Pipe





(Top) The mount alone. (Bottom) The archaeological pipe on its mount. This pipe is part of the collection of the ministère de la Culture et des Communications du Québec, and is displayed at the Centre d'interprétation de Place Royale. The mount was made by the museum technicians at the Musée de la civilisation, Québec. Photos: Michel Élie, Centre de conservation du Québec.

Description
This archaeological pipe was in three pieces when found. It was repaired, but remained fragile.

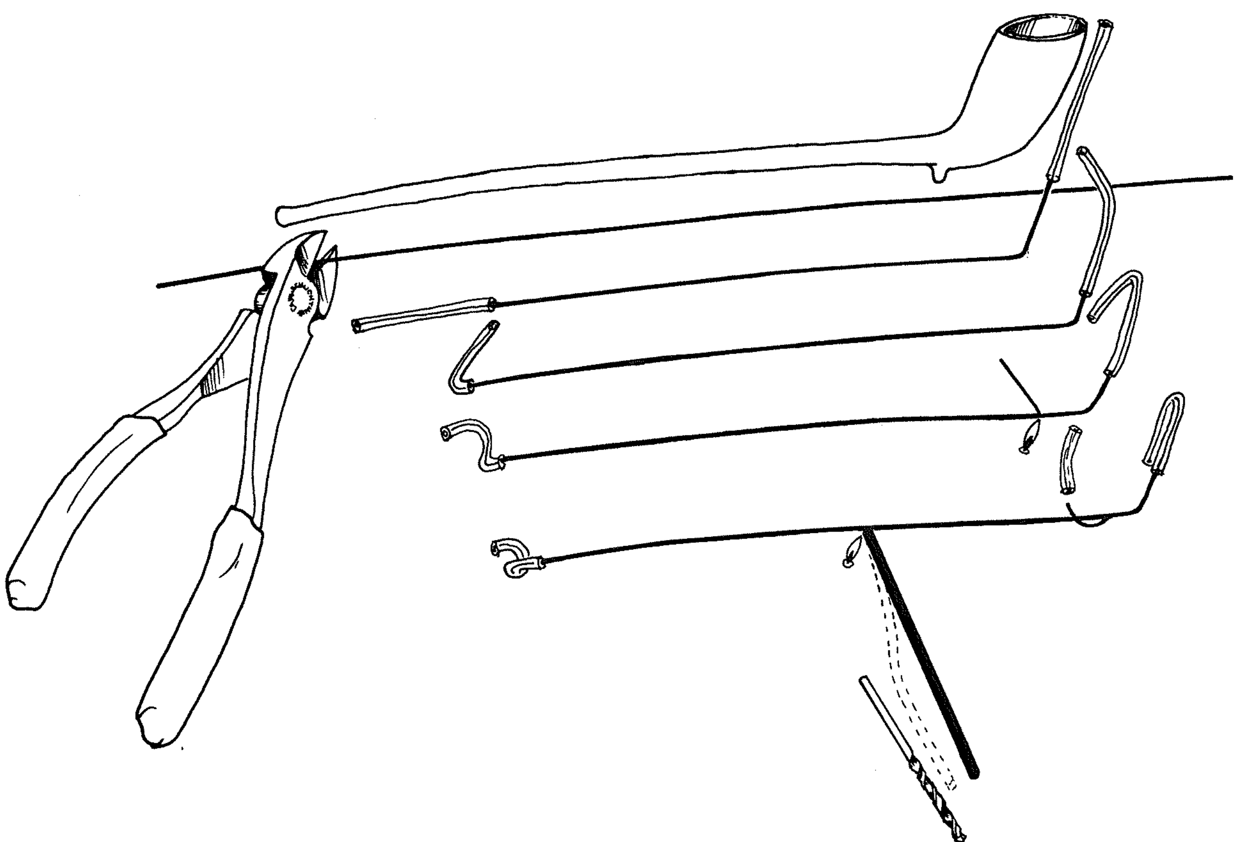
Display requirements
The pipe was to be mounted horizontally in profile view, and elevated from the base of the display case to mimic its appearance during use.

Mount design
The mount consists of a length of brass wire with three hooks and a base. The hook curling around the tip of the stem and the one cradling the foot of the pipe support its weight. These hooks, along with a third one at the bowl, also protect the pipe from lateral movement: the hook at the stem prevents front-back movement by curling around the pipe; the hook at the left of the pipe foot prevents left-right movement; and the hook that slips into the pipe bowl prevents both movements.
A mount stem is soldered to the middle of the wire so that the pipe can be attached to the wall of a display case.

Materials
brass wire
silicone tubing (or heat-shrinkable tubing)

Equipment
Soldering kit* (including propane or MPG torch and hard solder)
pliers
metal files
fine emery paper or sandpaper
drill
hot air gun or micro-torch (if heat-shrinkable tubing is used)

*See Appendix

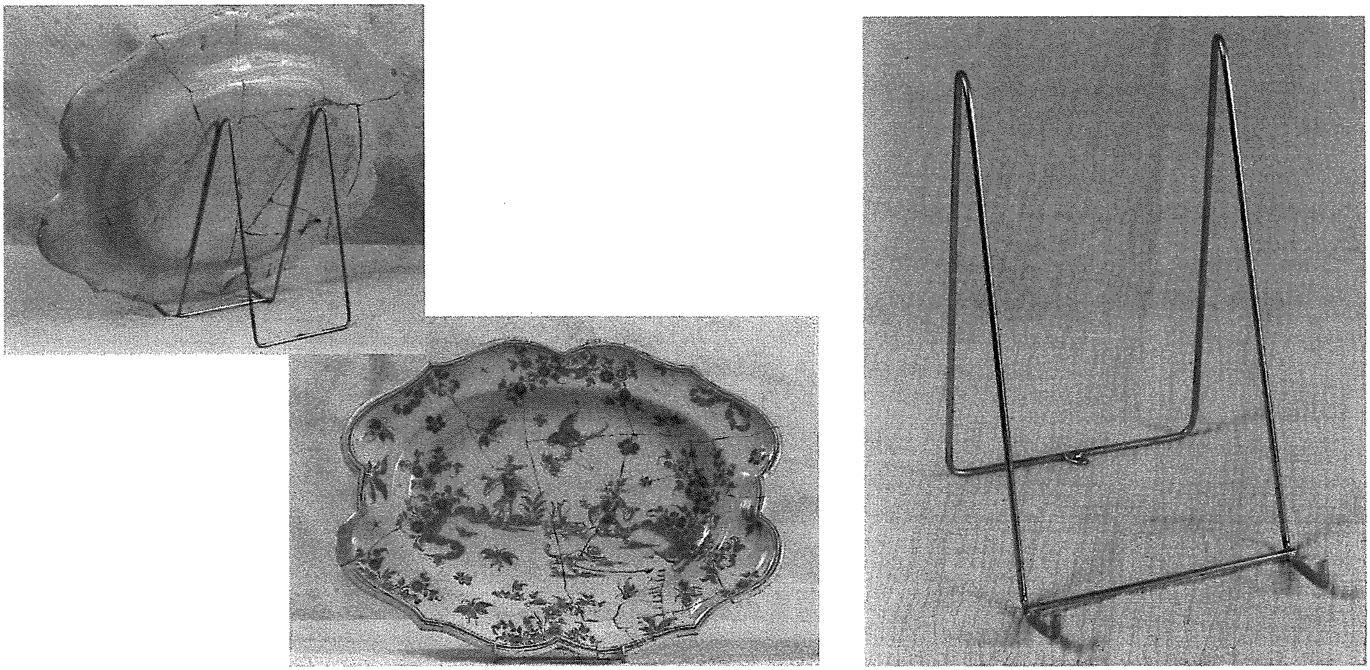


Procedure

- A brass wire was cut to length and bent at one extremity to follow the angle of the pipe bowl with respect to the stem.
- Two pieces of silicone tubing were cut and slipped onto the ends of the wire. This was done before the wire was bent further because the angle of the hooks would be too sharp for the tubing to be slipped on afterward.
- The ends of the wire were bent with pliers to form the hooks that would hold the pipe at its extremities (bowl and stem). This was done carefully to avoid damaging the tubing.
- An additional piece of wire that would hook onto the pipe foot was added to the main wire. First a small piece of wire was cut to length. Flux was then brushed on the main wire at the appropriate location, and heated with the torch. When the metal was hot enough, the wires were brought together and hard solder applied. When the soldering was complete, the wires were quenched in cold water and flux residues removed by scrubbing in hot water (this could also have been done by abrading the join with files, emery paper, or sandpaper).
- The foot-hook wire attachment was curved to shape, and silicone tubing was slipped over it as cushioning.
- The final step was to attach a brass wire near the mid-point of the mount so that it could be fixed to the wall of a display case. This wire was soldered into place and the join cleaned in the same manner as described above.

Note: Silicone tubing was used for this mount because its surface is less glossy, slightly more cushioned, and gives a better grip (which are all advantages if the object's surface is slick or delicate) than heat-shrinkable tubing. If heat-shrinkable tubing had been used, it would have been necessary to heat the tubing gently with a hot air gun or micro-torch to retract it onto the wire.

Plate



(Top left) Back view of the plate, showing the mount. (Bottom left) Front view of the plate on its mount. (Right) The mount alone. This plate is part of the collection of the ministère de la Culture et des Communications du Québec, and is displayed at the Centre d'interprétation de Place Royale. The mount was made by the museum technicians at the Musée de la civilisation, Québec. Photos: Michel Élie, Centre de conservation du Québec.

Description
This archaeological plate had been found in many sherds, and repaired. Its structure was sound, but the object remained fragile.

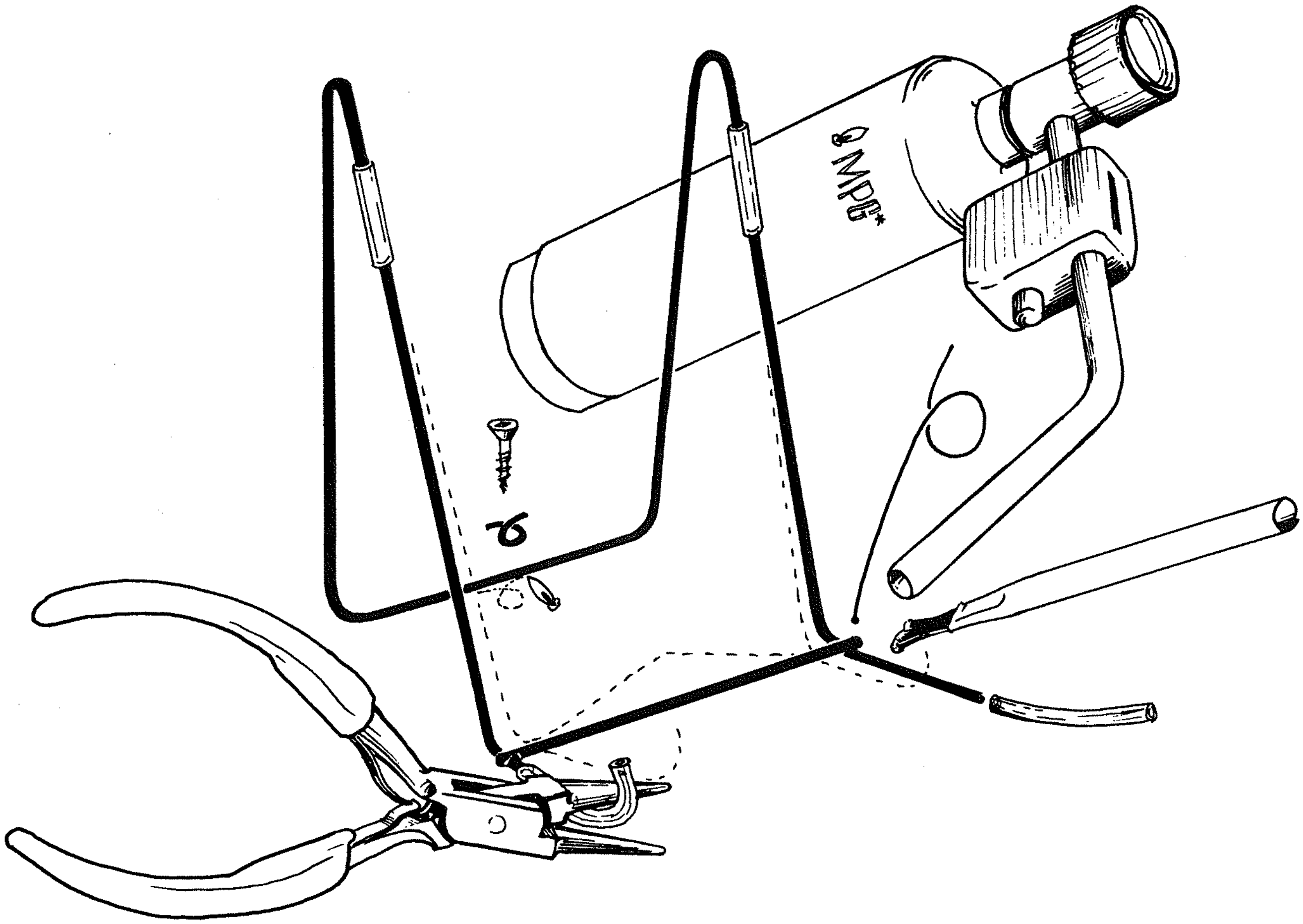
Display requirements
The plate was to be presented in a nearly vertical position so that it could be seen easily.

Mount design
The mount consists of brass wire that has been bent to shape, with reinforcing pieces of wire at the base. The weight of the plate is supported by the two hooks located at the front base of the plate, and the two spines at the back. The backward tilt of the mount and the two hooks at the base of the plate prevent front-back toppling. Left-right toppling is not a risk because the plate is balanced on its centre of gravity and there is a large area of contact. The distances between the spines at the back and between the two horizontal components at the base are sufficient to ensure the mount is stable; the anchoring loop for the back horizontal component also helps to stabilize the mount and plate.

Materials
brass wire
silicone tubing (or heat-shrinkable tubing)

Equipment
Soldering kit* (including propane or MPG torch and hard solder)
pliers
metal files
fine emery paper or sandpaper
hot air gun or micro-torch (if heat-shrinkable tubing is used)

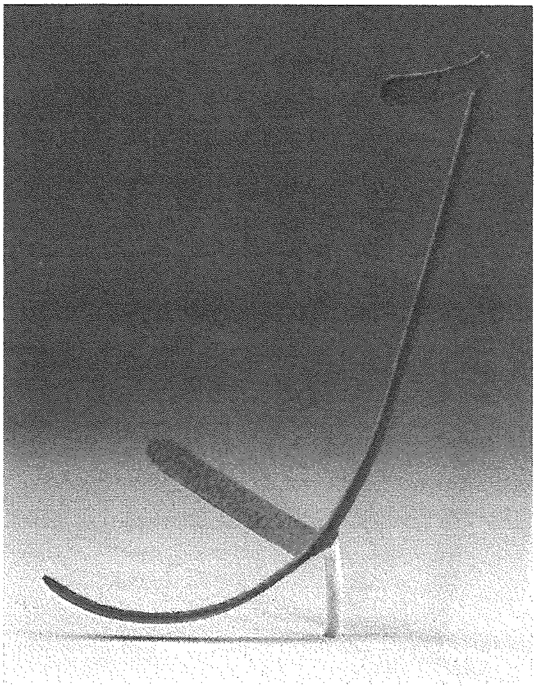
*See Appendix

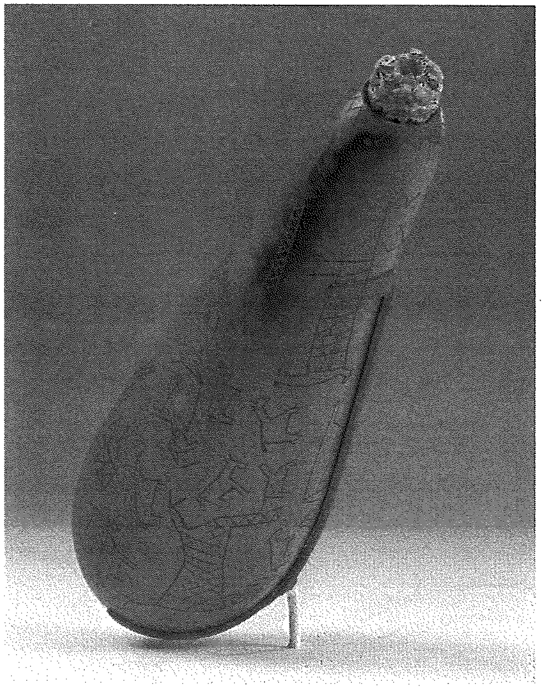


Procedure

- A long piece of brass wire was bent to create two inverted V-shapes, linked together at the base in the back. The two extremities that would support the plate were curved upwards to hold the plate securely.
- A straight strip of wire was cut and soldered to bridge the two front extremities and give the mount greater strength. Optionally (shown as a broken line in the illustration), this strengthening wire could be bent in a V-shape with the tip of the V going inwards towards the back of the mount; this might make the piece less visible after the plate was placed on the mount, depending on the viewing angle.
- A loop of brass wire was soldered onto the back base of the mount to provide a means of anchoring the mount to the display case with a screw. (See the previous example for a description of the soldering process.)
- Points of contact between the plate and the back of the mount were padded with silicone tubing.

Lengua Gourd Container





(Left) Side view of mount. (Right) Side view of Lengua gourd container, on its mount. This gourd container is the property of the National Museum of the American Indian (Accession No. 14/0621), where the mount was designed and fabricated by Shelly Uhlir. Courtesy, National Museum of the American Indian, Smithsonian Institution. Photos: Katherine Fogden.

Description

This hollow gourd container from Paraguay was 20.8 cm long. It was incised with decoration representing horses and animals, and had a corncob stopper. Although it was stable and in good condition, the surface was delicate and could easily be abraded.

Display requirements

The container was to be exhibited with the stopper pointing up and tilted slightly to the right so as to show the carvings of the horses and to mimic somewhat the angle of the gourd if it were hanging from a belt. Three sides of the object were to be visible.

Mount design

The mount consists of a brass rod stem supporting a blank made of four brass strips — a spine, two carrying tabs at the bottom, and one tab at the top. The bottom tabs, made of heavier stock, cradle the base of the gourd and carry most of its weight. The spine, the top and bottom tabs, and the backwards tilt of the mount prevent the gourd from toppling. The stem is located close to the deck to make its appearance unobtrusive. It allows the mount to be attached securely to a display case and, because it is made of annealed brass, it allows the display angle to be adjusted as desired.

Materials

brass strip and rod
clear acrylic spray
self-adhesive polyethylene suede
acrylic paints

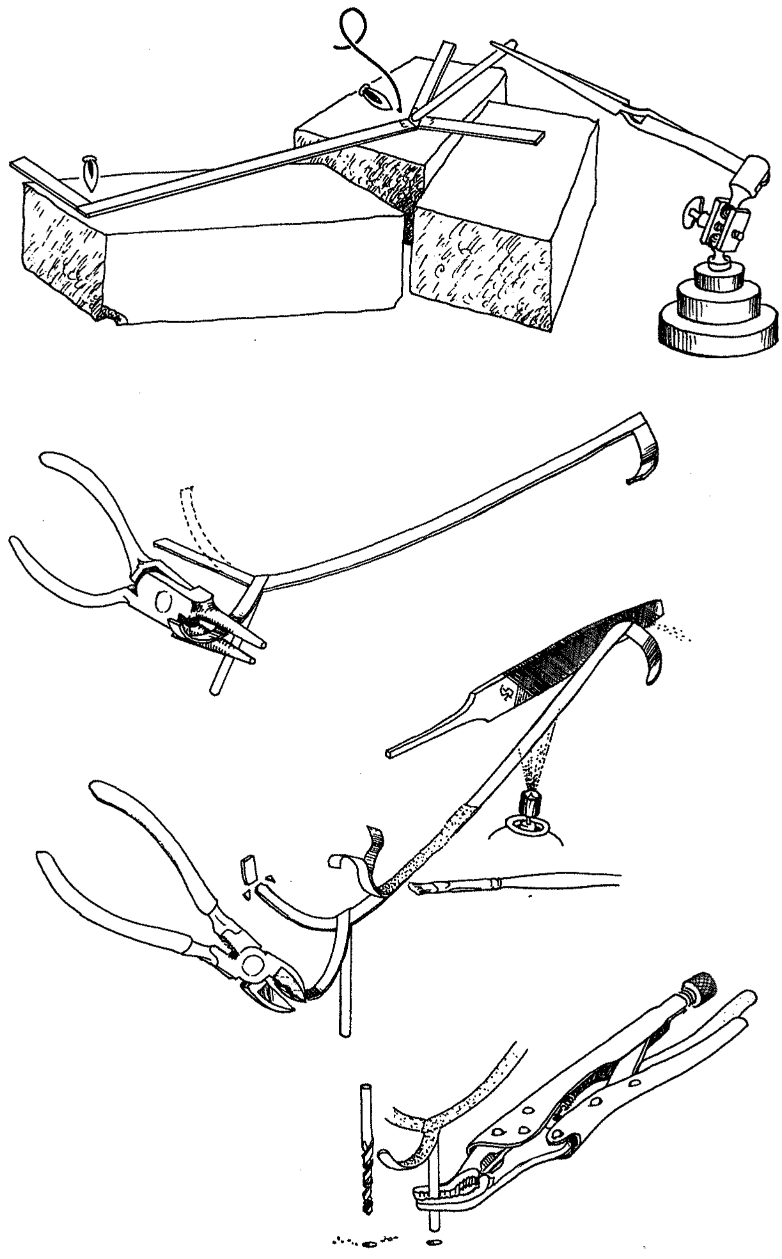
Equipment

Soldering kit* (including gas torch and 'easy' hard solder)
pliers
diagonal cutters
files
sandpaper
third hand
scissors
scalpel
paintbrushes

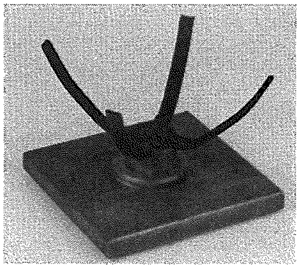
*See Appendix

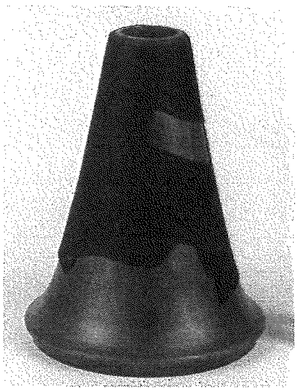
Procedure

- The brass rod stem and four brass strips were cut to length and the correct layout for the blank was determined.
- The main spine strip and the three tabs were silver soldered flat on firebricks with the stem rod held as close as possible to the desired angle with the third hand. The areas that were to be bent were also annealed at this time. The brass was then quenched in water and dried, and the flux residues were removed by scrubbing in hot water (or, alternatively, by abrading the join with files, emery paper, or sandpaper).
- The main element was bent with pliers to conform to the object, supporting the full back side of the gourd like a spine.
- The three tabs were bent to shape — two to cradle the curved bottom and the other to provide support at the top neck area — and the stem was bent to adjust the tilt of the object. During this bending and fitting process, any sharp edges of the metal were filed and scraps of padding were added to protect the object from possible scratches. Throughout this process, the shapes of the curves were regularly checked by placing the object with padding onto the mount.
- Once fitted, the bottom and side tabs were cut back to be as unobtrusive as possible while still providing a safe cradle for the object. The tabs were then filed to a bevel and sanded to remove all burrs. The rest of the brass was sanded to remove the oxidation from soldering.
- The fit was then double-checked to ensure that no distortion had taken place during the grinding, filing, and sanding process.
- To finish the mount, the brass was sprayed with clear acrylic to create a barrier between the brass and the object. The coating was allowed to dry overnight, and then a first coat of acrylic paint was brushed or dabbed on areas of the mount that would be seen or reflected. After the paint was dry, self-adhesive polyethylene suede padding in a closely matching colour was cut and attached. A final texture and detail painting was applied to the brass to help position the gourd and mask areas of the mount that would be visible.



Greek Red Figure Vase





(Left, top and bottom) The mounts for each section of the vase. (Above and right) The Greek red figure vase on its mounts. This vase is part of the Diniacopoulos collection of the Musée du Québec. The mount was made by André Bergeron, René Gagnon, Marthe Olivier, and France Rémillard, Centre de conservation du Québec. Photos: Michel Élie, Centre de conservation du Québec.

Description

This Greek red figure vase consisted of two detached pieces: a lower conical base and an upper jug-shaped section. It was partially restored, and missing parts were not to be replaced. Losses at the bottom of the lower conical section prevented it from standing upright, and the upper section was unbalanced because of large losses on the shoulder area.

Display requirements

The two sections of this ceramic object were to be mounted so as to replicate their original configuration.

Mount design

The mount consists of two sections, one for each piece of the ceramic vase. The section for the base of the vase is an internal felt-covered wooden support that conforms to the object's conical shape. Once inserted, it supports the weight of this piece evenly and prevents it from toppling. The upper section of the mount consists of four padded strips of aluminum that cradle the top piece of the vase, rising almost to its middle to hold it securely. A wooden dowel of appropriate length allows this section to be anchored to either the conical section or a flat wooden base that is as wide as the girth of the vase to ensure stability. This allows the two sections of the vase to be displayed together or independently.

Materials

Deccofelt
wood forms
stainless steel screws
aluminum strip
black acrylic latex paint
cardboard
wood dowel
felt
contact cement

Equipment

woodworking tools
calipers
lathe
brushes
scissors
metalworking tools
drill

Procedure

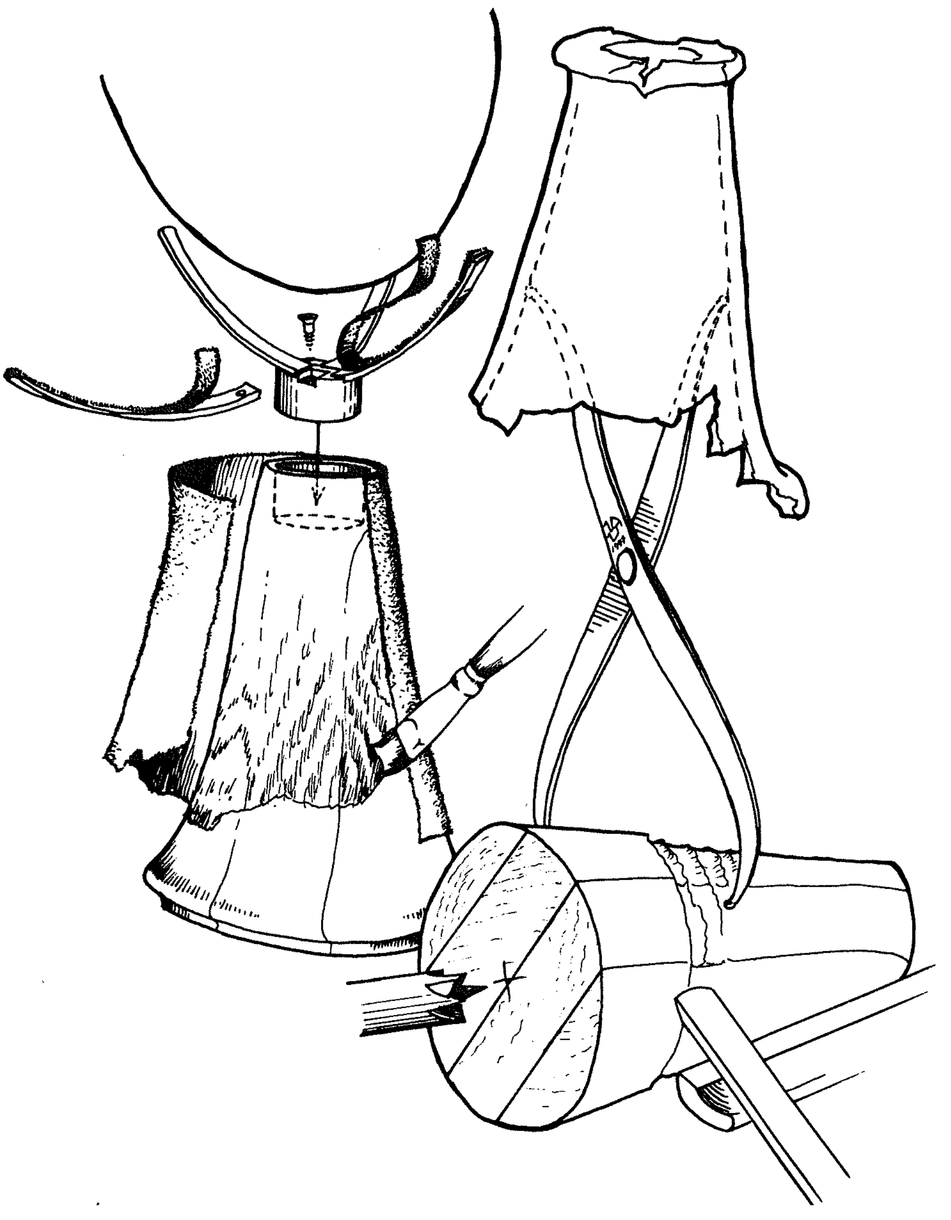
Bottom section of mount:

- The shape of the interior of the conical base of the vase was measured with calipers and transferred to a cardboard template.
- A piece of wood was turned to the correct size on a lathe, and then stained black.
- A cylindrical section was drilled out at the narrow end so the top aluminum strip mount could be slipped in.
- The shape of the bottom of the conical base of the vase was traced onto paper; this tracing was then transferred onto felt.
- The felt was cut and adhered onto the wood support using acrylic contact cement.

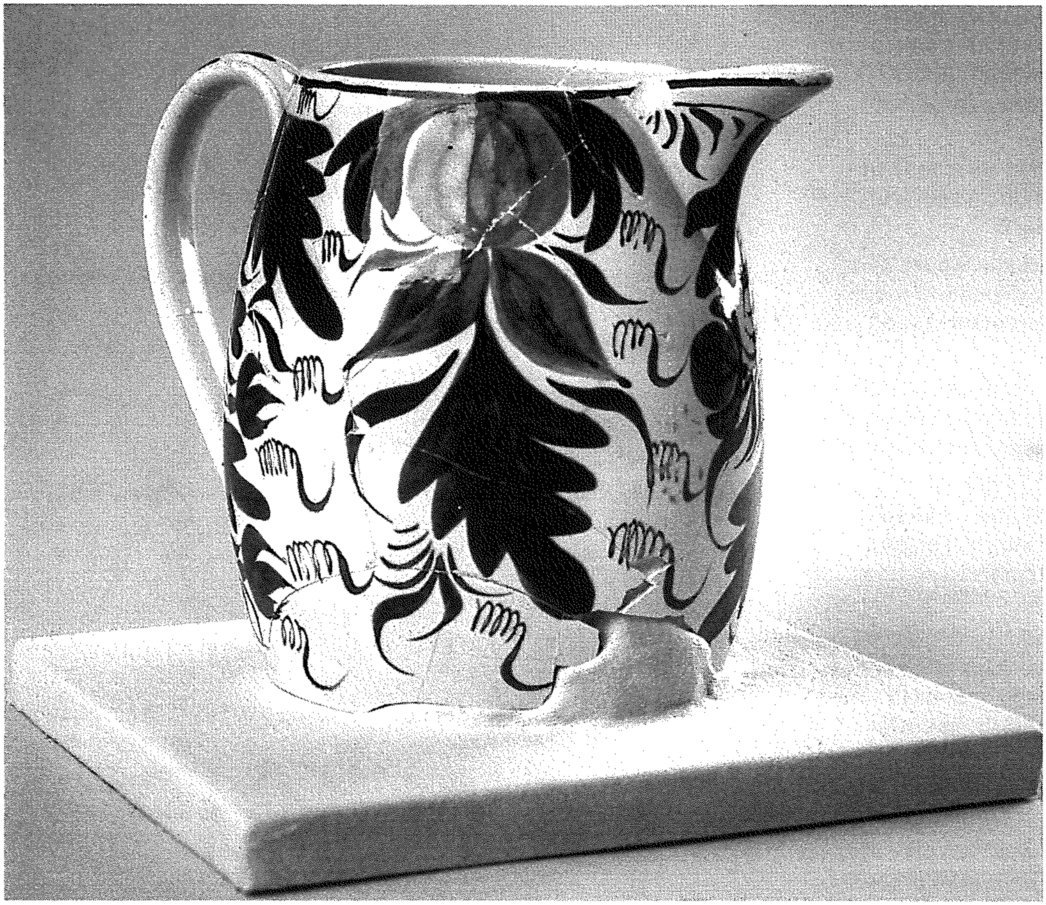
Top section of mount:

- Four aluminum strips were cut to length and bent to conform to the shape of the top section of the ceramic vase.
- Holes were drilled in the aluminum strips, the outside of the strips was painted black, and then the strips were attached to a wood dowel with screws.
- The inside of the strips was padded with Deccofelt.

Note: In this example the museum requested that the wood and strips be black, which makes the mount distinctly visible. However, colours that would help to camouflage the mount could also have been chosen.



Archaeological Pot



Archaeological pot on its mount. This pot belongs to the Collections Conservation and Management program at Sir Sandford Fleming College, Peterborough, Ontario. The mount was made by Clayton Smith, a student of the program. Photo: Canadian Conservation Institute.

Description

This archaeological pot lacked more than half of its base and could not stand upright. It had been repaired and was reasonably strong.

Display requirements

The pot was to be displayed vertically as if standing on a flat surface.

Mount design

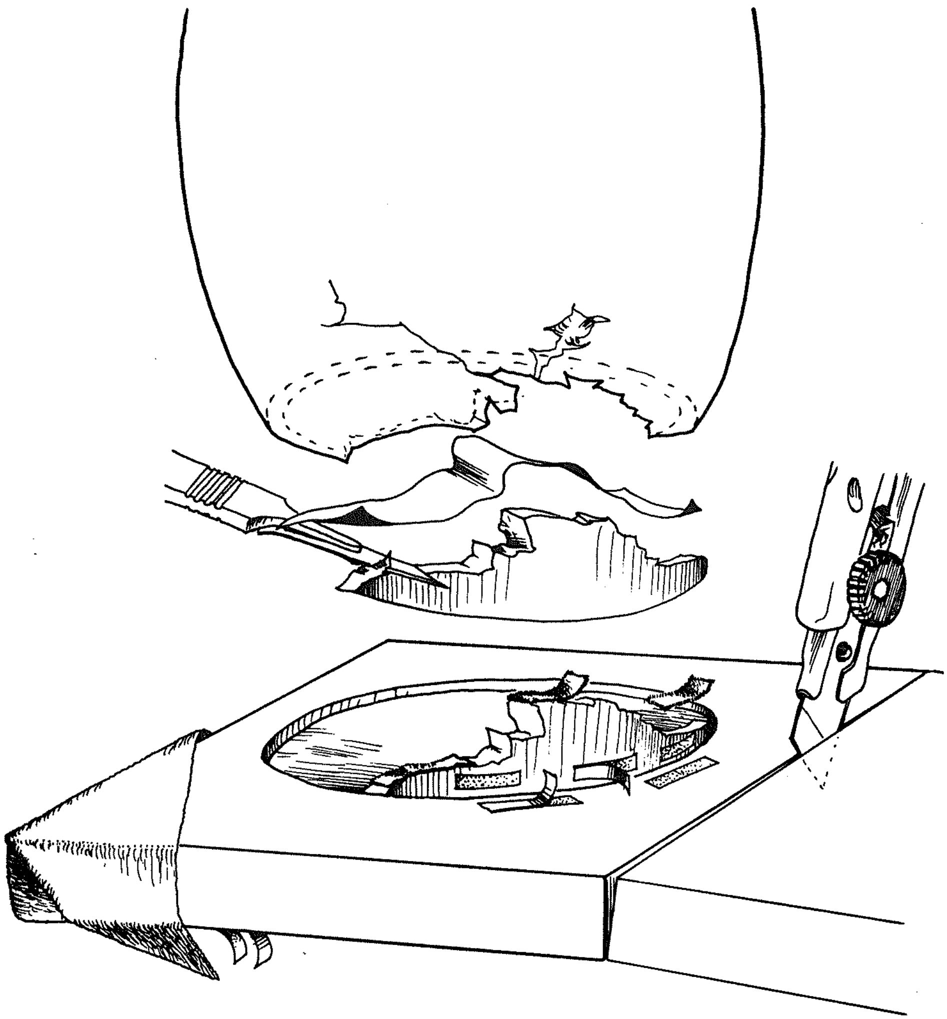
The mount consists of a large stable platform with raised areas that follow and support the damaged contours of the pot's base. The platform is made of polystyrene foam which is strong enough to support the weight of the pot but also yields a little to ensure a close fit. This design provides even support for the pot and allows it to stand securely upright.

Materials

polystyrene foam plank
carbon paper
jersey knit fabric
double-sided tape
felt

Equipment

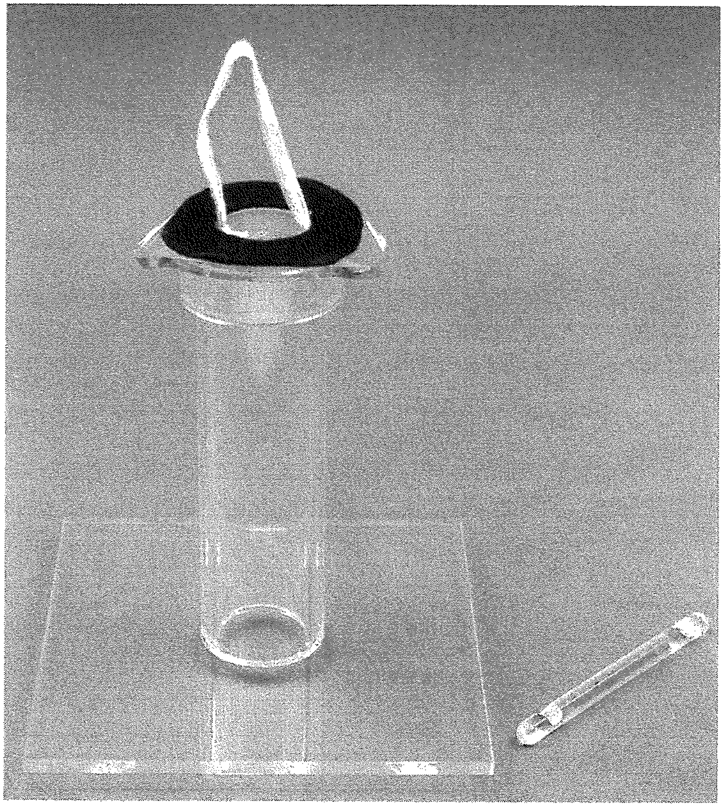
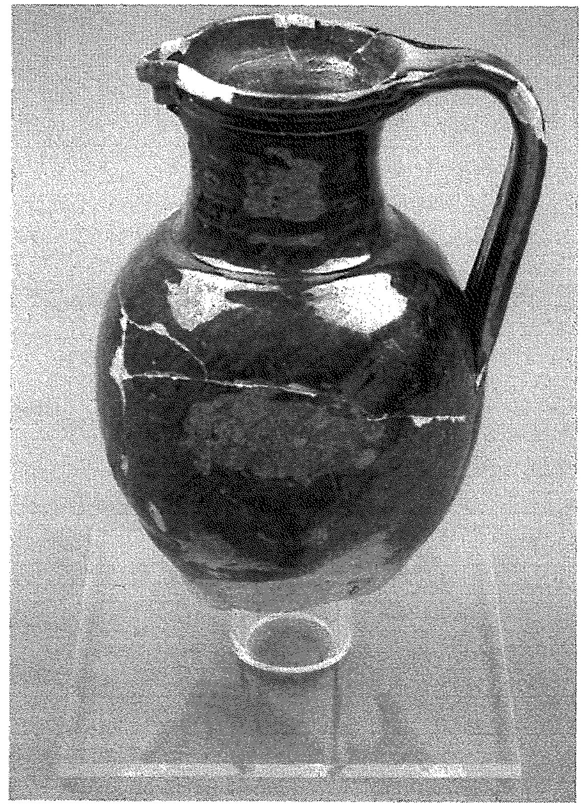
utility knife
scalpel with #11 blade
scissors
brush



Procedure

- A piece of polystyrene foam plank was cut to size with a utility knife to make the mount platform.
- A scalpel was used to carve a profile of the pot's broken base into the polystyrene foam base sheet and into a smaller piece of foam that would support the broken pot wall. To measure the profiles accurately, carbon paper was inserted between the pot and the foam, with the black carbon side towards the foam. The paper left black carbon marks on the high points that needed further carving. This was repeated several times until the carbon paper left even, light black marks over the whole foam surface, indicating close and uniform contact. Loose carbon was brushed off the foam.
- The small polystyrene foam addition was adhered onto a recess in the base with double-sided tape.
- The edges that came in contact with the pot were covered with felt adhered with double-sided tape.
- A jersey knit fabric was stretched over the entire foam mount and tacked down where required using small pieces of double-sided tape.

Archaeological Jug

(Left) Mount for archaeological jug. (Right) Archaeological jug resting on its mount. This jug is part of the collection of the ministère de la Culture et des Communications du Québec. The mount was made by André Bergeron. Photos: Michel Élie, Centre de conservation du Québec.

Description
This archaeological jug was almost complete, but lacked its foot; the missing pieces were not to be restored. It was in relatively strong, stable condition, but the narrow base was not strong enough to support the weight of the jug. The adhesive repairs were strong and could sustain the weight of the individual sherds.

Display requirements
The jug was to be displayed in a natural, upright position.

Mount design
The Plexiglas mount consists of a round cylinder attached to a square base. The top of the cylinder has a padded flange that supports the shoulders of the jug from the inside. Because the flange is wider than the jug's neck, there is no danger of the jug toppling off the mount. The large flat base ensures the mount and jug are stable.

Materials
Plexiglas sheet, 6.4 mm (1/4") thick
Plexiglas tube, 50.8 mm (2") in diameter
Plexiglas tube, 57.2 mm (2 1/4") in diameter
Plexiglas rod, 6.4 mm (1/4") in diameter
linen tape
methylene chloride
Deccofelt

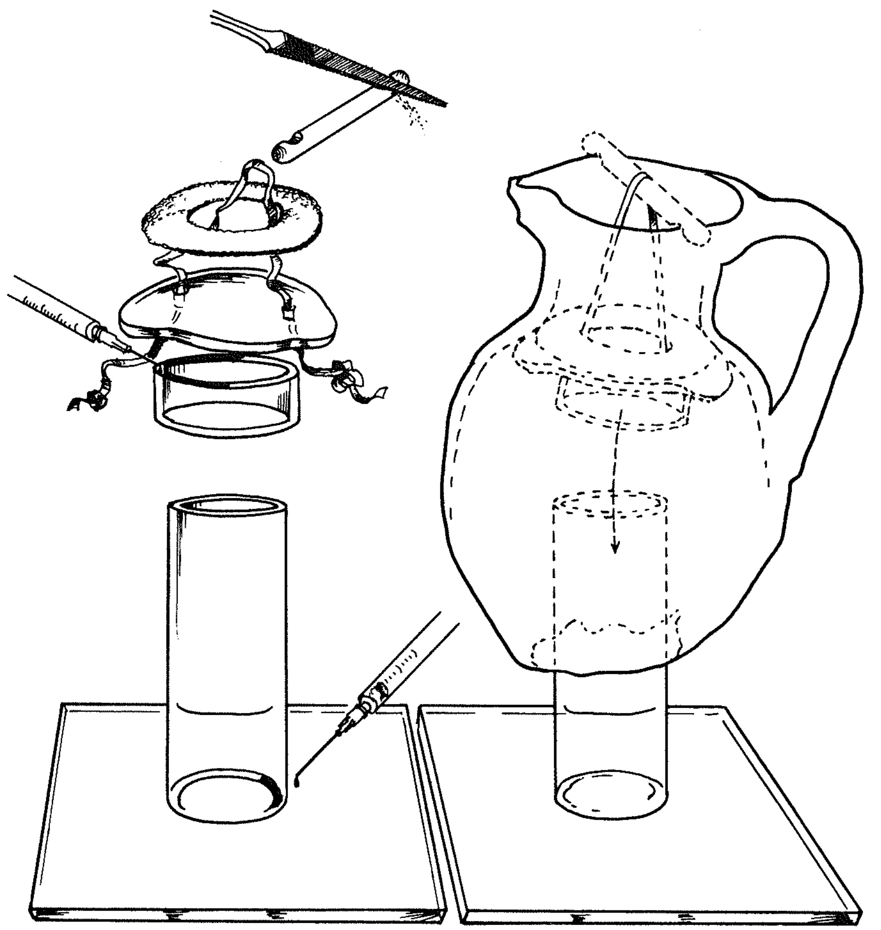
Equipment
Plexiglas cutting and polishing kit*
syringe
file
propane torch
drill
scissors

*See Appendix

Procedure

- A Plexiglas cylinder of 50.8 mm (2″) diameter and 3.2 mm (1/8″) wall thickness was cut and polished, and attached with methylene chloride to a square base of Plexiglas sheet. For stability, the square base was larger than the diameter of the jug.
- An elliptical piece of Plexiglas sheet was heated with a propane torch, and bent to conform to the curve of the jug's shoulders.
- Two small holes were drilled on each side in this piece and linen tape was inserted.
- The area where the jug would rest was padded with a ring of Deccofelt.
- A short Plexiglas cylinder of 57.2 mm (2 1/4″) diameter was adhered to the elliptical piece with methylene chloride.
- A Plexiglas rod was cut to a length slightly wider than the mouth of the jug. Using a file, the ends were rounded and two notches were made at a distance from each other that corresponded to the diameter of the jug's mouth.
- The padded elliptical piece of Plexiglas was inserted through the bottom of the jug and pushed upward with the fingers. The linen tape was pulled up through the mouth of the jug and the elliptical piece was positioned against the shoulder of the jug by pulling the tape.
- Once the elliptical piece was positioned properly, it was held in place by sliding the Plexiglas rod under the tape and allowing the notches to rest on the mouth of the jug.
- With the shoulder rest in position, the cylinder attached to the base of the mount was inserted through the bottom of the jug.
- After the jug was positioned on this cylinder, the rod was removed and the linen tape tucked inside the jug, out of sight.

Note: As an option, four small discs of thin Plexiglas could be adhered to the underside of the base with methylene chloride; this would make it easier to grip the support from below its base when picking it up.



Archaeological Ceramic

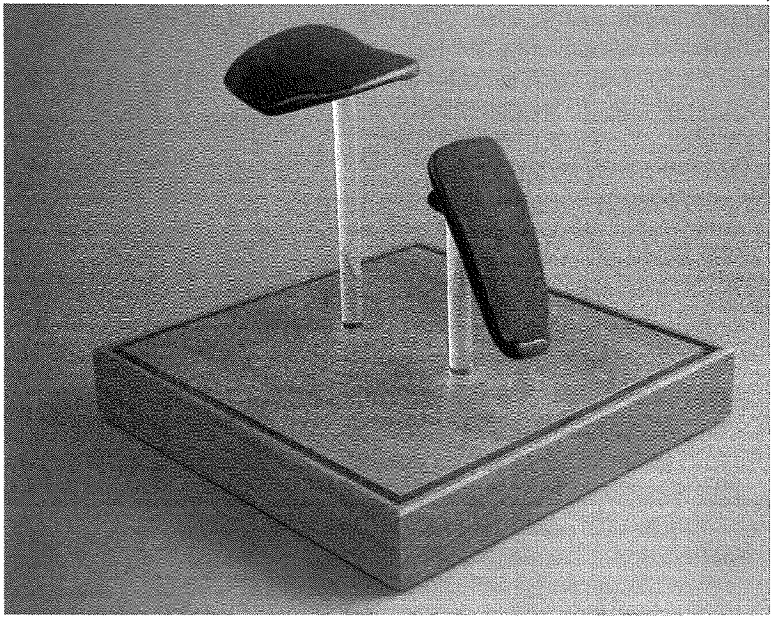
Description
This prehistoric potsherd consisted of many fragile pieces adhered together. It had a curved surface and no foot.

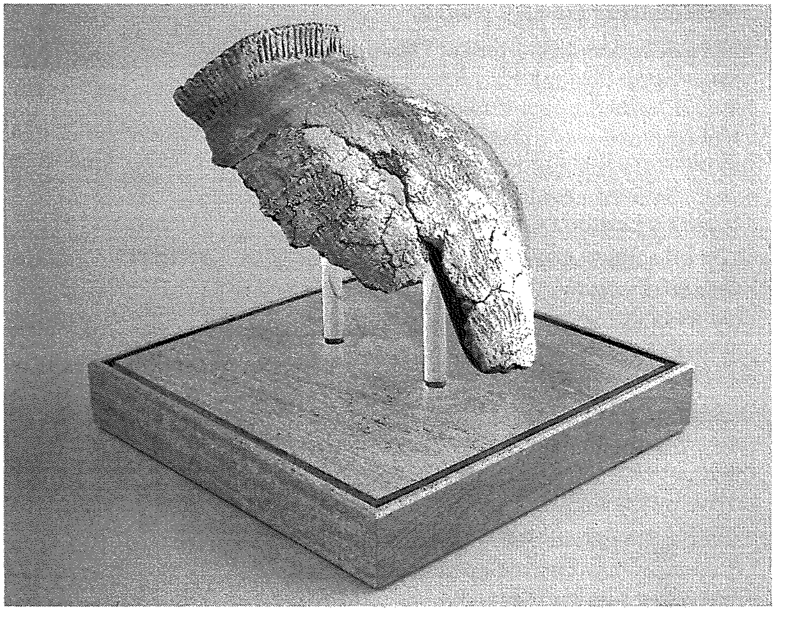
Display requirements
The potsherd was to be presented at an angle so that the incised designs on the outer surface and the rim could be seen easily from above.

Mount design
The mount consists of two epoxy putty supports on Plexiglas dowels that are inserted into a flat wooden base. The supports conform to the surface of the ceramic, thus distributing its weight over a large surface area. The top support carries most of the weight of the potsherd, and the bottom support has a curved lip to catch and grip its edge. The potsherd is protected from toppling by the shape of the supports, the angle of display, and friction. The Plexiglas dowels holding the epoxy supports are strong yet inconspicuous. The flat wooden base is wider than the potsherd to ensure it is stable and to prevent other objects from being placed too close to it. A groove along the top edge of the wooden base allows for the possibility of placing a Plexiglas vitrine over the mount.

Materials
epoxy putty
aluminum foil
acrylic paints
Plexiglas rods, 12.7 mm (1/2") in diameter
wood components and nails
5-minute epoxy adhesive
Deccofelt

Equipment
sandpaper (200 or 400 grit)
Dremel tool with dental drills
woodworking tools
drill
scissors
vacuum extraction system
dust mask and goggles
paint sprayer or brush

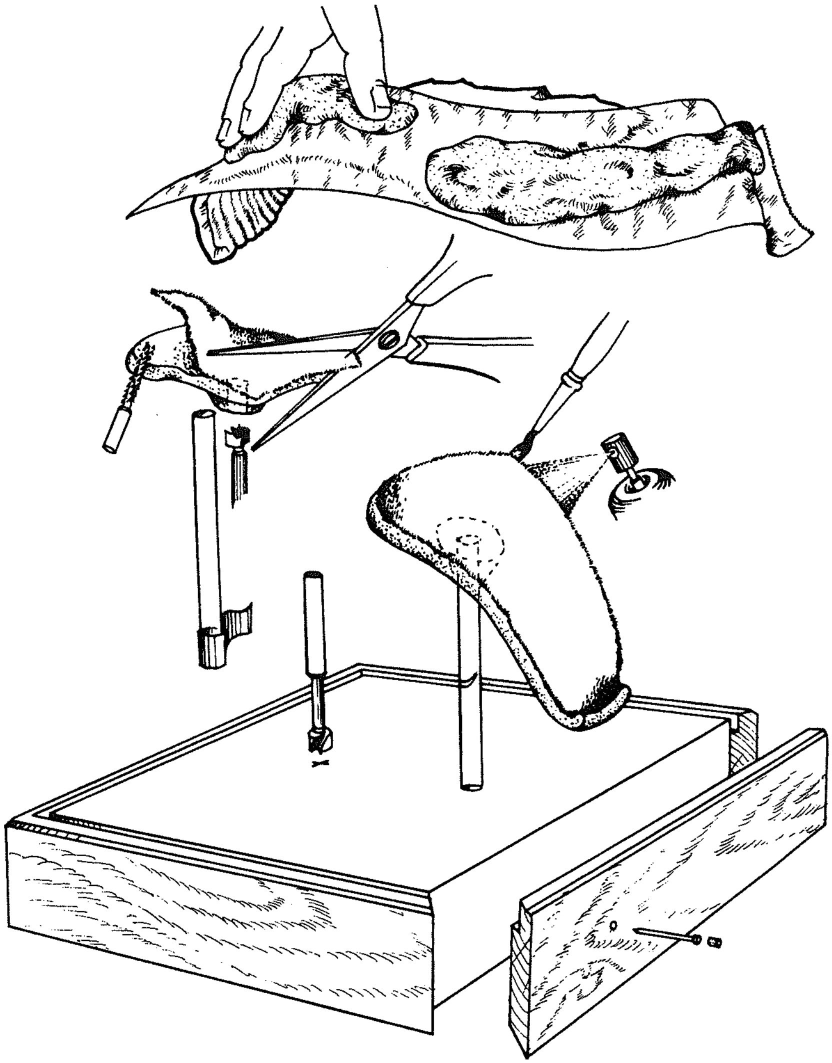




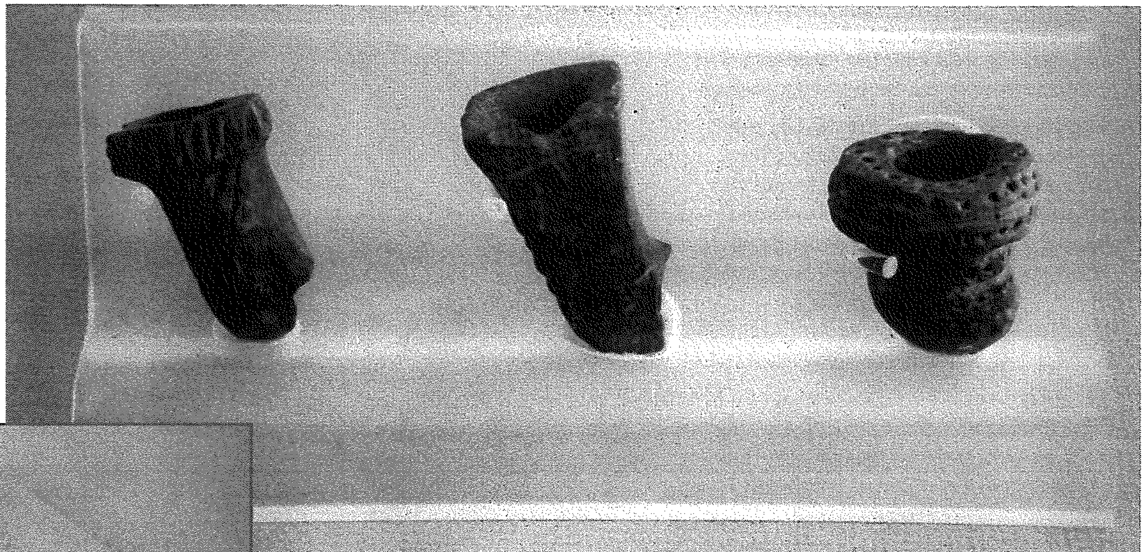
(Top) Mount for archaeological ceramic. (Bottom) Archaeological ceramic on its mount. This ceramic is part of the collection of the ministère de la Culture et des Communications du Québec. The mount was made by Patrick Albert and André Bergeron, Centre de conservation du Québec. Photos: Michel Élie, Centre de conservation du Québec.

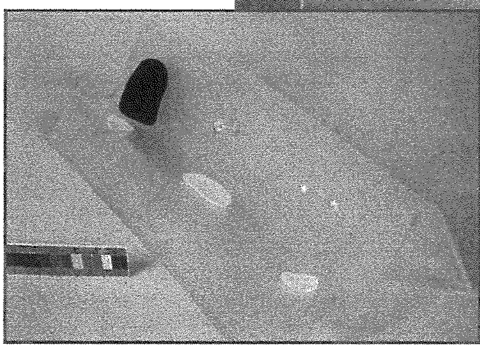
Procedure

- The number of epoxy putty supports, and their location, were determined.
- The potsherd was covered with aluminum foil (with the dull side facing inward) to protect it during the moulding process.
- The prepared epoxy putty was gently pressed against the shiny side of the foil, making sure it did not contact any unprotected surface of the potsherd. Shaping the putty carefully at this stage avoided having to carve off unwanted areas later. A lip was formed on the lower epoxy support to balance and secure the object, and bear some of the weight from below.
- The putty was allowed to cure for 24 hours. (The curing reaction is slightly exothermic, so it was necessary to ensure that the potsherd could withstand the heat.)
- The epoxy was cleaned up and smoothed with a Dremel tool followed by 200 grit, then 400 grit sandpaper. A dust mask and goggles were worn when sanding the epoxy, and dust was removed from the work area with a vacuum extraction system.
- Holes were drilled in the epoxy putty mould in preparation for inserting the Plexiglas rods.
- The edges of the epoxy were painted with acrylic paints and allowed to dry sufficiently. (Painting can be done by spray or brush).
- Once dry, all areas that would be in contact with the potsherd were padded with Deccofelt, thus ensuring there would be no direct contact between the potsherd and the paint.
- A wood base was made with grooves large enough to accommodate a Plexiglas cover.
- Holes were drilled in the wood base to take the Plexiglas rods. The rods fit tightly into the holes so glue was not needed.
- The epoxy putty supports were attached to the Plexiglas rods with epoxy resin adhesive, making sure the height, position, and angle between both parts were correct (a one-part mount would have the advantage of not requiring this fine-tuning).



Archaeological Pipes





Archaeological pipes on mount. (Inset) Mount for archaeological pipes. These pipes are part of the collection of the ministère de la Culture et des Communications du Québec. The mount was made by André Bergeron. Photos: Michel Élie, Centre de conservation du Québec.

Description
These little archaeological pipes were incomplete and had rounded bases that made them difficult to mount. They were in stable condition but their surfaces were vulnerable to abrasion.

Display requirements
The pipes were to be mounted upright and angled slightly so they could be viewed comfortably.

Mount design
The mount consists of a curved Plexiglas support with carved recessed nests for the pipes. The pipes are supported mainly by the padded nests for their bases, but they also rest slightly against the curved back wall of the mount. The backward tilt and the securing tabs prevent them from toppling.

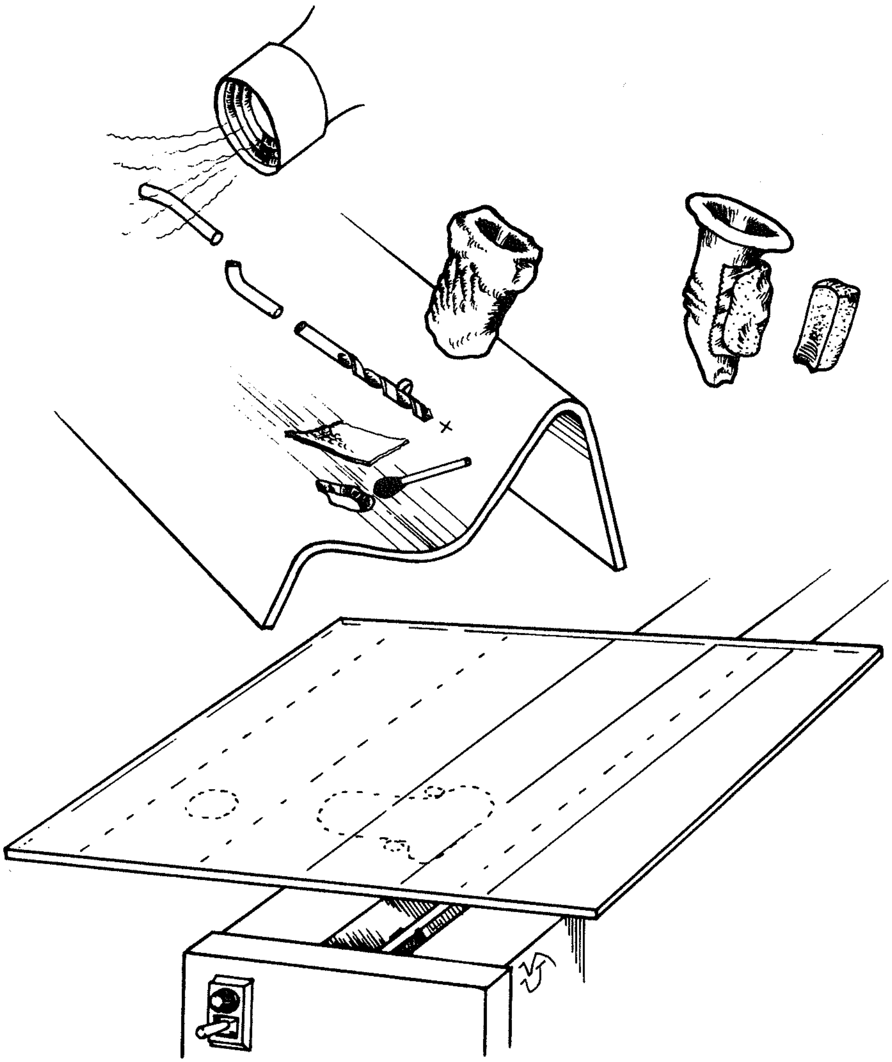
Materials
cardboard
Plexiglas sheet (frosted)
Plexiglas rod, 3.2 mm (1/8") in diameter
methylene chloride
aluminum foil
epoxy putty
epoxy resin adhesive
Deccofelt (white and black)

Equipment
Plexiglas cutting and polishing kit*
hot-wire bender
hot air gun
Dremel tool with coarse fluted milling burr and other dental drills
syringe
graphite pencil
scissors
drill

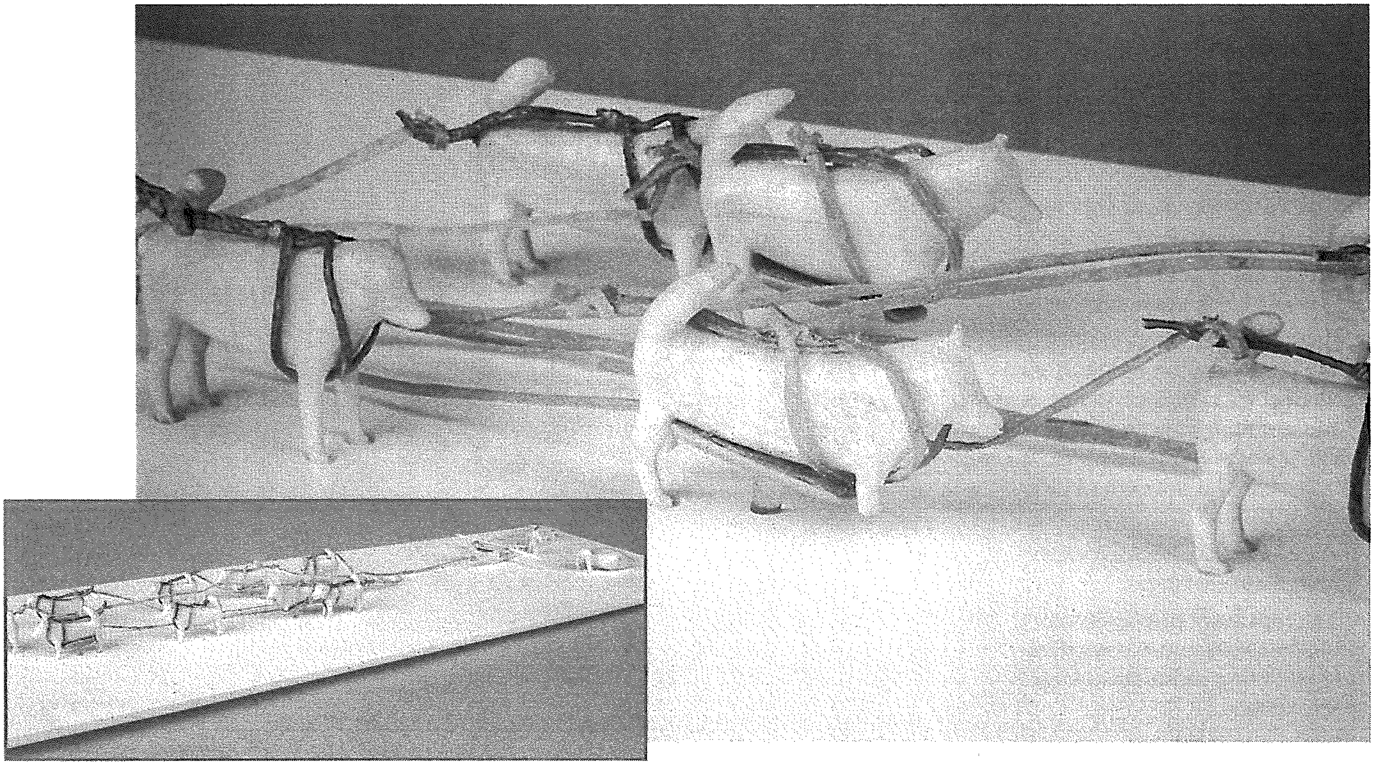
*See Appendix

Procedure

- A cardboard template was made to replicate the entire mount, including the front and back support, the feet, and all the bends.
- The shape was transferred to the Plexiglas sheet, which was cut to shape and polished.
- The Plexiglas was angled using a hot-wire bender.
- The positions of all the objects were marked on the base with pencil.
- Recessed nests were carved out of the platform of the mount with a Dremel tool equipped with a coarse fluted milling burr and other dental drills; for the roundest pipe, a recess was made into the wall of the mount as well.
- White or black Deccofelt was applied as padding.
- The pipes were placed on the Plexiglas base and the position of stabilizing rods was marked with pencil.
- Holes were drilled where marked on the Plexiglas base.
- Using a hot air gun, the Plexiglas rods were bent and the curve checked against the object (but only after the rods had cooled).
- The rods were inserted and glued in place with a drop of methylene chloride applied with a syringe.
- For the pipe on the left side of the mount, a back support was moulded out of epoxy putty using an aluminum foil interleaf, as described in the previous example. This support was padded with black Deccofelt and attached to the Plexiglas with epoxy resin adhesive.



Miniature Ivory Dogsled



Detail of the recesses for the dogs' feet and of a belly support for a dog missing one leg. (Inset) Full view of the miniature ivory dogsled on its mount. This object is part of the collection of the Musée régional de la Côte-Nord. The mount was made by André Bergeron and France Rémillard, Centre de conservation du Québec. Photos: Michel Élie, Centre de conservation du Québec.

Description

This object consisted of nine ivory dogs with dogsled fixtures made of skin lashings, and a sled, a man, and a walrus also carved from ivory. A few of the dog carvings could no longer stand because one or two of their limbs were broken or missing. Missing parts were not to be replaced through restoration.

Display requirements

The ivory figures were to be mounted on a base in a natural position.

Mount design

The mount consists of a plank of matte white Plexiglas with tiny recesses for each of the dogs' paws and for the sled runners. These recesses hold the carvings securely and keep them from toppling. Where a dog's leg is broken, its belly is supported from below with a padded epoxy putty mould held with a Plexiglas dowel onto the Plexiglas plank. Matte white Plexiglas was chosen to simulate a snow-covered surface.

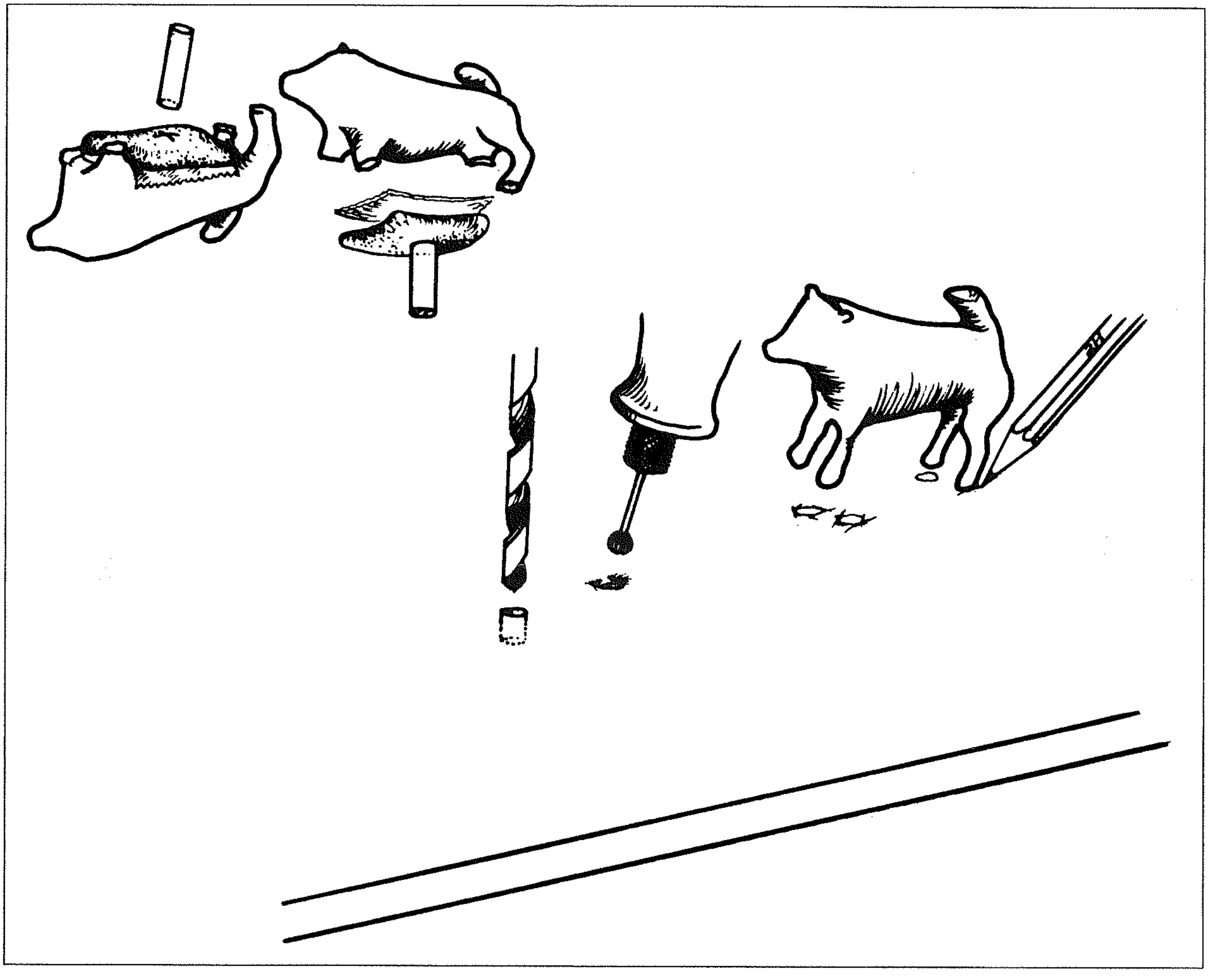
Materials

Plexiglas sheet (matte white)
Plexiglas rods, 3.2 mm (1/8") in diameter
aluminum foil
epoxy putty
Deccofelt
Plexiglas solvent adhesive

Equipment

Plexiglas cutting and polishing kit*
drill
Dremel tool with coarse fluted milling burr and other dental drills
fine sandpaper
files
graphite pencil
scissors

*See Appendix



Procedure

- A rectangular piece of matte white Plexiglas sheet was cut and the edges were polished. The location of each figure was marked with a graphite pencil.
- A Dremel tool equipped with a coarse fluted milling burr and other dental drills was used to make small recesses in the Plexiglas base to accommodate the dogs' paws and the sled runners.
- Epoxy putty mould supports were made on the undersides of the dog figures using the technique described for the archaeological ceramic on p. 65.
- The epoxy supports were finished with files and fine sandpaper.
- Holes are drilled in the epoxy supports for inserting Plexiglas dowels, which were held in place with Plexiglas solvent adhesive.
- The belly supports were cushioned with beige Deccofelt.
- Holes were drilled in the Plexiglas base to fit the rods that held each epoxy support. The rods were secured with solvent adhesive.

Conclusion •

Each new mounting project provides an opportunity to be creative. The mounts we have presented illustrate only a few of the endless possibilities in shape, combinations of materials, and design. But all good mounts have certain characteristics in common:

- they value the preservation needs of the object over aesthetic qualities, while remembering the importance of unobtrusiveness;
- they are designed to provide stability and prevent toppling;
- they make judicious use of stable materials;
- they avoid the use of numerous materials and complex forms and designs, which are usually expensive in terms of both supplies and labour; and
- they take into account the ease of mounting and dismounting the object.

All these factors must be weighed and assessed to produce a good design tailored to the unique needs of the object.

New materials and techniques appear on the market regularly. But all makers of museum mounts should be wary of untried trends that might have gained popular usage without having been sufficiently tested for museum conservation use. In cases of doubt, a conservator should be consulted. As a general rule, new materials and techniques should be used only after careful monitoring to confirm that the performance and stability of these innovations can be trusted.

We hope that this publication has acquainted readers with the important issues that need to be considered and with a variety of the materials and techniques currently used to produce good-quality exhibit mounts. As mount-makers ourselves, we are always interested in broadening our experiences and look forward to hearing new ideas from readers. This second edition incorporates many ideas from our readers, and we hope that improvements will continue to be suggested. As with the first edition, we consider this book a stop on the way, not the end of the journey.

Yup'ik masks (detail). Courtesy, National Museum of the American Indian, Smithsonian Institution. Photo: Katherine Fogden.

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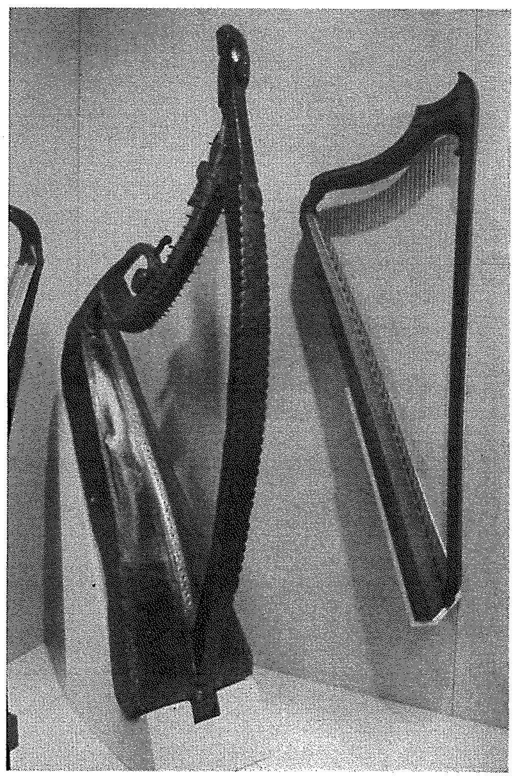

Photo: Museum of Fine Arts, Boston.

Appendix: Tools and Equipment

Following is a list of tools and equipment accumulated through the authors' experience, but it is by no means definitive. Access to woodworking and metalworking machinery is a great advantage, but it is surprising how much can be accomplished with relatively simple hand tools.

Plexiglas cutting and polishing kit
Hacksaw (for straight cuts)
Coping saw (for curves)
Files
Scraper
Sandpaper block
Sandpaper
Soft cloth
Plexiglas polish
Vise

The Bibliography contains references to Plexiglas working techniques, and further information is available from the manufacturers in the form of data sheets.

Soldering kit
Torch (propane, acetylene, MPG, or butane)
Electric soldering iron
Fire bricks or fireproof pad
Igniter
Third hand (a type of clamp)
Miscellaneous clamps and spring clips
Pliers
Hard solder (e.g. silver/copper)
Soft solder (e.g. lead/tin or tin/silver)
Hard soldering flux (borax)
Soft soldering flux (ferric chloride or rosin)
Paintbrushes for flux
Brass wire brush
Water bath (for quenching)
Optional: Pickling solution (sodium bisulphite or citric acid)
Copper tongs

Good quality or new tools should not be used in soldering, as they become stained, fire blackened, and rusty.

Hand tools
Backsaw
Bench vise
Cake knife (for foam plastics)
C-clamps (various sizes)
Centre punch
Clothespins
Coping saw and blades
Countersink
Crosscut saw
Curved knives
Diagonal cutters
Files (assorted)
Files (needle set)
Frame saw and blades
Gouges (various shapes)
Hacksaws (small and large)
Hacksaw blades (small; large and fine; and large and coarse)
Hammer
Hand drill
Hand vise
Olfa utility knife and blades
Paintbrushes
Pliers (small and large)
Sandpaper and block
Scalpel
Scissors (general and fabric)
Scraper
Screwdrivers (assorted)
Scriber
Sewing equipment
Small tools (miscellaneous set)
Stapler
Syringe, 1 mL
Tinsnips
Wire cutters
Wood plane

Measuring tools
Calipers
Carbon paper
Carpenter's square
Draftsman's flexible ruler
Pencils (HB)
Profile gauge (plastic)
Ruler (plastic)
Tape measures (cloth and steel retractable)

Electrical equipment
Dremel tool
Electric drill and drill bits (inch set and number set)
Hot-melt glue gun
Hot air gun
Hotplate
Hot-wire bender
Tacking iron