

A Portrait Miniature Project at Library and Archives Canada

Maria Trojan-Bedynski, Carol Aiken, Alan Derbyshire, Gilbert Gignac and John Grace

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A Portrait Miniature Project at Library and Archives Canada

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In 2005, Library and Archives Canada (LAC) initiated a project to develop expertise in the conservation of portrait miniatures in North America and to facilitate access to these unique objects. With the support of a grant from the Getty Foundation, a five-day training workshop followed by a five-week treatment phase was completed in 2007. Eleven Canadian and American conservators participated in the workshop, “The Care and Treatment of Portrait Miniatures”, led by Alan Derbyshire, Head of Paper, Books and Paintings Conservation at the Victoria & Albert Museum (V&A), London, UK. Highlights and learning outcomes from the workshop are summarized in this article, including a summary of various problems and treatment options for portrait miniatures painted on vellum or on ivory. For the treatment phase, LAC engaged Carol Aiken, a senior conservator who specializes in the treatment of portrait miniatures, to collaborate with a staff member in initiating treatment of the LAC collection. Several examples from the treatment project demonstrate how different problems routinely associated with miniature portraits on ivory were addressed. The diversity of materials, styles and origins make the care and treatment of portrait miniatures a complex and interesting conservation specialty, and one that benefits from a collaborative approach.

En 2005, Bibliothèque et Archives Canada (BAC) a lancé un projet visant à développer une expertise en conservation des miniatures en Amérique du Nord et de faciliter l'accès à ces objets uniques. Grâce à une subvention de la Fondation Getty, un atelier de formation de cinq jours ainsi qu'une phase de traitement de cinq semaines ont pu être complétés en 2007. Onze restaurateurs canadiens et américains ont participé à l'atelier « Soins et traitement de miniatures » dirigé par Alan Derbyshire, restaurateur et chef d'équipe de l'atelier Papier, Livres et Peintures au musée Victoria & Albert (V&A), Londres, Royaume-Uni. Les points saillants et conclusions de l'atelier sont résumés dans cet article et un sommaire de divers problèmes et solutions de traitement possibles est présenté pour les miniatures peintes sur vélin et sur ivoire. Pour la phase de traitement, BAC a embauché Carol Aiken, restauratrice spécialisée dans le traitement de miniatures, pour amorcer le traitement des miniatures de la collection du BAC en collaboration avec un membre du personnel. Plusieurs exemples tirés des traitements effectués montrent comment différents problèmes couramment associés aux miniatures sur ivoire ont été abordés. La diversité des matériaux, de styles et d'origines rendent les soins et le traitement des miniatures complexes et intéressants, et en font une spécialité qui bénéficie grandement d'une approche collaborative.

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Introduction

The art of portrait miniature painting was introduced at the English and French courts at the beginning of the sixteenth century. During the Renaissance, portrait miniatures of royal and aristocratic figures became popular diplomatic gifts, and were also statements of love and fidelity. By the eighteenth and nineteenth centuries people at all levels of society had their portraits painted in miniature, the most common form of private portable image of friends and loved ones until the invention of the daguerreotype photograph in 1839. The ubiquity of the miniature portrait was demonstrated by numerous period references in literature, music and art. For example, there are scenes in William Shakespeare's “Hamlet” and “Twelfth Night” involving portrait miniatures, and in Wolfgang Amadeus Mozart's 1791 opera, “The Magic Flute”. Over the centuries many artists have depicted sitters wearing or holding miniature portraits of loved ones.¹



Figure 1. Gilbert Gignac showing a portrait miniature in a custom made box and portrait miniatures cabinet, Art Vault, LAC Preservation Center, Gatineau, Quebec. On top of the cabinet is an example of a shoe box in which miniatures were previously housed. Photo: Maria Bedynski.

Portrait Miniatures in Canada

Although the development of miniature painting in Canada emerged after 1759 with the establishment of British North America, the earliest recorded portrait miniature was in Nouvelle-France (Quebec) over 100 years earlier. Jeanne Mance (1606-1673), the first lay nurse in North America, travelled from Paris to Montreal in 1641 with a portrait miniature of her benefactress Madame de Bullion (ca.1593-1664).² Jeanne Mance bequeathed the miniature to her religious order a few years before her death in 1673, but it was unfortunately lost in a fire in 1695. Today more than 1300 portrait miniatures are held in over twenty public institutions across Canada.³ Library and Archives Canada (LAC), Ottawa, houses one of the more important

collections of historical portrait miniatures (**Figure 1**) along with the Montreal Museum of Fine Arts and the McCord Museum of Canadian History in Montreal, Quebec. There are also large and significant collections in the Canadian Art and European Decorative Arts Collections of the Royal Ontario Museum and in the Thompson Collection at the Art Gallery of Ontario, Toronto, as well as at the Beaverbrook Art Gallery in Fredericton, New Brunswick, the Nova Scotia Museum in Halifax, and in Quebec City at the Musée national des beaux-arts du Québec.

LAC Portrait Miniature Collection

LAC's collection of over 130 portrait miniatures is part of a



Figure 2. Representative selection of LAC portrait miniatures. Top from left to right: Robert Shore Milnes Bouchette?, *Simeon Marchessault*, watercolour on ivory, ca. 1838, 75 x 60 mm, LAC R11017-1; Unknown Artist, *Mrs. Colonel William Claus (Catherine Jordan)*, watercolour on ivory, late eighteenth century, 23 x 19 mm, LAC 1989-407-7; Unknown Artist, *Colonel William Claus age 10*, brown wash on ivory, ca. 1775, 37 x 32 mm, LAC 1989-407-6; Unknown Artist (Plimer?-signed on rear: "Mr. Plimer"), *William Pitt Amherst, Earl of Amherst*, watercolour on ivory, ca. 1790-1800, 45 x 37 mm, LAC 1979-14-16; Nathaniel Plimer?, *William Pitt Amherst, Earl of Amherst*, watercolour on ivory, ca. 1800, 73 x 59 mm, LAC 1979-14-10; Franz Xaver Winterhalter, *Queen Victoria*, watercolour on ivory, ca. 1840, 84 x 69 mm, LAC 1959-1-6; Gerald Sinclair Hayward, *Sir Wilfrid Laurier*, watercolour on ivory, 1902, 88 x 69 mm, LAC 1982-213-1. Bottom from left to right: Andrew Robertson, *Anne McGillivray, née Easthope*, watercolour on ivory, 1838, 116 x 90 mm, LAC 1972-92-3; Cornelius B. Durham attributed, *Admiral Sir Charles Ogle*, watercolour on ivory, 1850, 170 x 125 mm, LAC 1982-202-1; Lady Henrietta Martha Hamilton, *Demasduit (Mary March)*, watercolour on ivory, 1812, 75 x 65 mm, LAC 1977-14-1; Henry Bone, *George IV as Prince Regent*, enamel on copper, 1815, 81 x 65 mm, LAC 1959-1-5 (above the portrait of Demasduit). Photo: Maria Bedynski and Norman Paul.

much larger portrait collection documenting the history of Canada. Two of the more important portrait miniatures are those of Native Americans: Demasduit (Mary March, ca. 1796-1819), the last surviving member of the now extinct Beothuk tribe of Newfoundland and Thyoninhokovrawen (born John Norton, ca. 1760-1823), made chief of the Mohawk Nation. There are also portrait miniatures of members of the British royal family including the Prince Regent and a young Queen Victoria, of Canadian Prime Ministers such as Sir John David Sparrow Thomson and Sir Wilfrid Laurier as well as military leaders such as field marshals Sir Jeffrey Amherst and George Townsend, and civic leaders including Simon and Ann McGillivray, Doctor Wolfred Nelson, and Judge Gabriel-Elzéar Taschereau. Other portraits depict settlers, loyalists and explorers (**Figure 2**).⁴

The majority of LAC miniature portraits are painted in watercolour on ivory, while a few are executed on paper or card, or in enamel on copper supports.⁵

Most of the smaller portraits are encased in oval-shaped lockets, some of which could be worn as jewellery. Various larger pieces are presented under cover in leather cases or in frames suitable for standing or hanging. Most of the portraits were painted in the nineteenth century by European, American and Canadian artists trained in the French or English miniature painting traditions. Among the European artists represented are Henry Bone, Louie Burrell, Cornelius Durham, John Cox Dillman Engleheart, Francis Ferrière, Lady Henrietta Hamilton, Pierre Huaut, Mary Anne Knight, Andrew Robertson, William Ross and Franz Xaver Winterhalter. American artists include Charlotte Deming, James Peale and Henry Colton Shumway. Interesting works by later Canadian artists such as Gerald Sinclair Hayward and Juliette de Lavoye demonstrate that the miniature tradition continued as an art form in Canada well into the twentieth century.

Preservation History of LAC Portrait Miniature Collection

The collection is accessible to the public under appropriate and controlled conditions. Many historically significant works were acquired regardless of previous damages, with the expectation that conservation treatment would eventually be carried out for their continued preservation and use. Expertise in such specialized conservation treatment though, was lacking. Requests for consultations, exhibitions and loans increased over the years but the majority were reluctantly refused due to the miniatures' poor or fragile condition. A revival of interest in Canadian portrait miniatures during the past fifty years resulted in graduate study research at some Canadian universities.⁶ Increasing demand for reproductions of portrait miniatures in popular and scholarly publications, and for digital on-line access, and anticipated exhibition use by LAC's Portrait Gallery of Canada program, in turn increased the level of priority to provide physical access to these fragile but important images. Following recommendations from a comprehensive 1985 survey,⁷ the collection, previously stored in an unstable environment and in mere business envelopes and shoe boxes, was moved in 1997 into state-of-the-art environmental conditions at the new LAC

Preservation Centre in Gatineau, Quebec. At this time a custom-designed box was constructed for each portrait miniature (see **Figure 1**). In spite of these improvements, access to many damaged miniatures was still limited, and discussions about conservation treatment resumed with renewed vigor.

In 2002, LAC art collections manager, Gilbert Gignac, and Alan Derbyshire, Head of Paper, Books and Paintings Conservation at the Victoria & Albert Museum (V&A), London, UK, explored possibilities for training a LAC Fine Arts Conservator in the treatment of portrait miniatures. Further discussion among Maria Bedynski, Gilbert Gignac and John Grace, Director of Conservation Treatment at LAC, led to the development of a project to increase capacity in North America for portrait miniatures conservation. It consisted of a one-week training workshop led by Alan Derbyshire, who has extensive experience with British miniatures, and a five-week period of treatment of LAC's collection by Carol Aiken, a portrait miniature conservator based in Baltimore, Maryland. The project was generously supported by a Conservation Grant from the Getty Foundation.

The Workshop

The training workshop entitled "The Care and Treatment of Portrait Miniatures" was developed and led by Alan Derbyshire. It took place at the LAC Preservation Center in collaboration with the Portrait Gallery of Canada, the Canadian Conservation Institute, and the Queen's University Art Conservation Program from 15 to 19 October 2007. Eleven conservators from Canada and the USA participated.

Alan Derbyshire gave illustrated lectures describing the history and techniques of European portrait miniatures painted on vellum and ivory.⁸ A review of the work of important miniature portrait painters illustrated the development of materials and techniques, such as the early use of vellum supports, which were later superseded by ivory supports that endured until the advent of photography. Traditional conservation techniques and recently developed alternative treatments were described and their outcomes evaluated (**Table I** and **Table II**).⁹ Various methods of light control used to display miniatures at the V&A were discussed.¹⁰ Mr. Derbyshire also explained the advantages of using Raman spectroscopy as a non-invasive, non-destructive method of pigment analysis.¹¹

The V&A survey form for miniatures, designed to assess the four main components, i.e. frame, glass, paint layer, and support, was introduced and studied. The condition of each component was categorized on a scale of 1 to 4 to establish a priority rating for combined stability and treatment. Participants used a microscope to compare different painting techniques and materials, and learned to recognize deterioration resulting from mould, crystal formation, flaking and splits in ivory supports.

Participants were also given the opportunity to practice painting a miniature on vellum – an exercise that provided insight into the miniaturist's working process. A short film produced by

Table I. Conservation of Portrait Miniatures Painted on Vellum. Selected learning outcomes from Workshop and Treatment Phase of LAC Portrait Miniature Project.

Materials and Techniques	Problems	Treatment Options	Comments	
<p>16th century portrait miniatures on vellum</p> <p><u>Medium:</u> transparent watercolours and thickly applied bodycolours, prone to flaking and pigment loss.</p> <p><u>Support:</u> vellum attached with starch paste to pasteboards or unprinted side of playing cards.</p> <p><u>Prominent Artists:</u> Lucas Hornebolte, Holbein, Levina Teerlinc, Nicolas Hilliard, Isaac Oliver</p>	Surface dirt / dust	Carefully use soft brush under microscope, and, if necessary, powdered eraser and/or swabs of ethanol.	Particular care needed when paint is fragile. May be necessary to consolidate any flaking paint first.	
	Delamination of vellum from a playing card	Repair by local application of starch paste or methylcellulose, and gentle pressure. Sometimes it is better to separate the vellum completely and then re-lay onto the playing card.	<u>Caution:</u> jewels and ruffs can easily be damaged.	
	Delamination of vellum from a table-book leaf, and flaking gesso	Separate vellum from the table-book leaf mechanically using scalpel or spatula.	Table-book leaf should be conserved and retained in frame.	
		Line vellum with Japanese paper using fairly dry wheat starch paste. Stretch lining around laminated paper board to hold miniature flat for framing		
	<p>17th century portrait miniatures on vellum</p> <p><u>Medium:</u> watercolour with added lead white pigment.</p> <p>In response to the demand for more realistic images, the pure emblematic colours of the 16th century became muted, more gummied, and mixed with a greater addition of lead white pigment to give softer, more natural tones.</p> <p><u>Support:</u> vellum attached to pasteboards or table-book leaves.</p> <p>Around 1630, playing card or pasteboard supports were replaced by table-book leaves made from a relatively thick piece of vellum coated on both sides with a layer of gesso. Table-book leaves were to be drawn on in metal point. They were very smooth, larger and more rigid than playing cards and offered a perfect support for the increased size of this period's miniatures, and range in size from 45 mm to 80 mm.</p> <p><u>Prominent Artists:</u> Peter Oliver, John Hoskins, Samuel Cooper, Richard Gibson and Peter Crosse</p>	Flaking of paint layer	Traditionally, Paraloid B72 in non-aqueous solvent, such as acetone was used for consolidation of flaking paint. <u>Alternative:</u> 2% solution of methylcellulose in water. This can be diluted with ethanol to make it less aqueous. Apply to flaking area with fine brush under microscope.	Tends to leave shine and is inflexible. Readily absorbed and has softening effect, allowing flakes to be gently pressed into place with less danger of being damaged <u>Caution:</u> Jewels made from stained turpentine resin remain soluble in solvents such as ethanol; consolidate with aqueous solution only.
		Varnish	Miniatures from 16th and 17th centuries were not originally varnished. Remove using ethanol or acetone.	Take particular care of paint layer. Varnish is often an indication of previous restoration and attempt to hide retouching.
	Blackening of lead white	Traditionally treated by brushing ethereal hydrogen peroxide solution to affected areas. <u>Alternative:</u> introduce hydrogen peroxide via Gore-Tex sheet: soak blotting paper in 7% solution of hydrogen peroxide, cover with Gore-Tex sheet, place layer of Melinex with holes cut to correspond with area of discoloration, place miniature face down on this system, and monitor.	This method is quicker, easier to control, and there is no need to use ether. <u>Caution:</u> Test all pigments for sensitivity to bleaching and since miniature is face down, check regularly.	

Alan Derbyshire, “*How a Miniature Was Made*”, served as an effective introduction to this exercise.

One day of the workshop focused on practical treatments using mock-ups, miniatures from LAC’s collection and examples brought by participants. Treatments included humidification and flattening of ivory supports, consolidation of flaking paints, removal of paper and card backings, repair of splits in ivory (**Figure 3**), treatment of mould, and the use of goldbeater’s skin for sealing. Participants also learned to identify the symptoms of glass disease. The day concluded with an examination of a variety of frames and lockets that provided an appreciation of how difficult and time-consuming it is to open and close them (**Figure 4**).

The final afternoon was hosted by the Canadian Conservation Institute, where staff conservators and conservation scientists demonstrated and evaluated various techniques for the non-destructive analysis of portrait miniatures.

An evening of free public lectures on the subject of portrait miniatures was presented at the National Gallery of Canada. Included were the presentations *The Intimate Portrait: Miniatures in the Collection of Library and Archives Canada* by Eva Major-Marothy, Senior Curator of Acquisitions and Research, LAC Portrait Gallery of Canada program; *Seeing Demasduit* by Dr. Kristina Huneault, Research Chair, Concordia University, Montreal; and *The Materials, Techniques and Conservation of Portrait Miniatures* by Alan Derbyshire.

Table II. Conservation of Portrait Miniatures Painted on Ivory. Selected learning outcomes from Workshop and Treatment Phase of LAC Portrait Miniature Project.

Materials and Techniques	Problems	Treatment Options	Comments
<p>18th century portrait miniatures on ivory</p> <p><u>Medium:</u> watercolours (with added gum arabic)</p> <p><u>Support:</u> ivory (cut tangentially down through the tusk)</p> <p>In the early 1700s Rosalba Carriera, the Venetian pastel painter was the first to adopt ivory as a support for small watercolour portraits.</p> <p>Early miniatures on ivory were executed on thick pieces of ivory (1-2 mm) and they remain in fairly good condition. Significantly, they are usually not adhered to paper or card and therefore do not warp as much.</p> <p>Throughout the 18th century, ivory supports became increasingly thinner (0.1-0.2 mm) and were more heavily treated to whiten them and to help the paint adhere more easily to the surface.</p> <p>From 1740, miniatures on ivory were adhered to paper or thin card by the artist. They often contain signatures and inscriptions that must be retained.</p> <p><u>Prominent Artists:</u> Bernard Lens, John Smart, Jeremiah Mayer, Richard Cosway, William Wood, George Engleheart.</p>	<p>Warped and/or cracked ivory supports</p>	<p><u>Humidification in a chamber</u> Chamber contains a layer of silica gel preconditioned 10-20% above ambient RH. Place the ivory on a perforated support above a bed of silica gel to ensure that exposure is as uniform as possible.</p> <p><u>Humidification using Gore-Tex</u> Place Gore-Tex on top of damp blotting paper, place silicon paper on Gore-Tex to avoid off-setting of the paint layer, place the warped ivory on the silicon paper, cover in plastic, invert miniature from time to time to allow it to become evenly humidified, and change the silicon paper to prevent the paint layer adhering.</p> <p><u>Flattening</u> Place humidified ivory between silicon paper and glass plates and hold with bulldog clips.</p> <p><u>Repairing</u> Traditionally animal glue (no longer recommended) was often used but it tends to yellow and can show through the ivory.</p> <p>Cracks in ivory supports can be repaired using thin Japanese paper and Mowilith DMC2, a stable, flexible and reasonably strong adhesive.</p> <p>Another method is to fit the cracked or split ivory pieces as closely as possible and tack them together by applying tiny drops of cyanoacrylate adhesive from the verso.</p>	<p><u>Caution:</u> Paint layer is extremely sensitive to moisture.</p> <p>It is usually necessary to remove old paper backings before placing the miniature in the chamber or Gore-Tex system.</p> <p>It usually takes a couple of hours for ivory to relax and flatten in the chamber or Gore-Tex system, but it can take much longer, and may require several repeat treatments.</p> <p>Considerable skill is necessary to keep the ivory in plane during this procedure and to avoid the cyanoacrylate adhesive from seeping through to the recto.</p>
	<p>Paper backings with inscriptions</p>	<p>Peel off, cut, or shave away using scalpel.</p> <p>To retain paper backings with inscriptions intact, separate with controlled application of moisture delivered in a solution of methylcellulose or Laponite gel. Alternatively, apply moisture carefully with a brush; saliva works well as it is more viscous than water.</p>	<p>Every effort should be made to preserve the backings of miniature portraits intact, whether inscribed or not.</p>
	<p>Flaking of paint layer</p>	<p>Consolidation as for portrait miniatures on vellum. See Table I.</p>	<p>See Table I.</p>
	<p>Blackening of lead white</p>	<p>See Table I.</p>	<p>See Table I.</p>
<p>19th century portrait miniatures on ivory</p> <p><u>Medium:</u> watercolours (with gum arabic, sometimes very gummy)</p> <p><u>Support:</u> ivory (cut tangentially, or turned on lathe)</p> <p>In the 19th century, miniatures were painted on a larger scale. They are often about 140 x 180 mm and the ivory support tends to be thicker (around 0.5 - 1 mm).</p> <p>Because of the larger size, the grain density tends to vary across the ivory. This increases irregular warping, which does not respond well to flattening treatments.</p> <p><u>Prominent Artists:</u> Henry Bone, Andrew Robertson, John Cox Dillman Engleheart.</p>	<p>Mould</p>	<p>Powdery mould can be mechanically removed using soft brush and/or swabs of ethanol under magnification.</p> <p>Foxing type of mould: If absolutely necessary, mechanical removal using scalpel, or bleach locally with hydrogen peroxide.</p>	<p>This treatment can sometimes leave localized areas of paint with a matte appearance due to loss of gum; can be retouched with non-aqueous medium.</p> <p>Foxing type of mould is more difficult to remove as it tends to stain the ivory.</p>
	<p>Crystal formation</p>	<p>Treatment is very difficult or impossible. Crystals are soluble in water, as is the paint layer.</p> <p>One possibility is to coat the paint layer with microcrystalline wax to hide the crystals by altering the reflective index of paint. 'Virtual' alternative is to flood surface with white spirit - crystals become temporarily invisible - then photograph before white spirit evaporates.</p>	<p>Crystals are various forms of magnesium phosphate. They most probably are forming on the ivory under conditions of high humidity.</p>
	<p>Retouching</p>	<p>Use non-aqueous media such as Paraloid B72 in acetone or ethanol, MS2A (a ketone resin) in white spirit, or PVA such as Lascaux or Mowilith 20 in acetone/ethanol.</p> <p>Recently, Gamblin colours, Artcare colours and Paraloid B72 in Methoxy Propanol have been used with success.</p>	<p>MS2A is easiest to use because of slower evaporation rate but tends to yellow and is a little glossy; it is easier to get a matte finish with Mowilith 20. At the V&A, retouching is kept to a minimum and would normally be carried out only in the background to tone down a particularly disturbing area of damage.</p>

The Condition Surveys

The workshop was followed by a five-week treatment project of LAC portrait miniatures under the supervision of Carol Aiken. In preparation, Ms. Aiken undertook a preliminary two-day visit in February of 2007 to review a group of one hundred miniatures with damages previously identified in the 1985 collection survey, subsequently updated by Maria Bedynski in 2003. Treatment priorities ranging from minor maintenance to major interventions were reviewed and in some instances re-assigned. Among the deleterious conditions noted were accretions of dust, grime, and mould on painted surfaces and in housings; cracked or broken ivory supports with deformations of associated materials, such as backing papers or cards; flaking or losses in paint layers; deficient, inappropriate or non-existent framing; unstable cover glasses; and previous restorations.

The two-day review was a vital first step in the planning process for the treatment project. It facilitated the development of a database that collated existing information about each miniature in an easily accessible form that could be revised throughout the treatment project. The review also ensured that required materials and equipment (of types not always readily available or difficult to find, ie. convex replacement glasses for the framing) were identified in advance and available for the project. These special arrangements and additions to the budget were anticipated, and the schedule planned to ensure completion of as many treatments as possible in the time available.

Treatment of LAC's Portrait Miniatures

The goal of this phase of the project was to treat forty to fifty priority items, as time permitted. The progress of every treatment was documented in writing and with digital images. Forty-one portrait miniatures and their enclosures received some level of attention. Collections managers, curators, and other staff conservators from LAC were also actively engaged through periodic meetings to discuss the treatment options and discoveries. Throughout the project, treatments were designed to be object specific, meaning that the procedures chosen for a particular miniature might not be applicable to the treatment of a similar but different miniature. A number of factors were considered in the design of each treatment. **Tables I** and **II** identify alternative treatment approaches to general problems.

Painting Technique

North American miniatures are usually painted in water-based media on ivory supports. Most average between five and ten centimetres in height and were executed using painting techniques that include stippling (paint applied as 'dots' using the tip of a brush), hatching (paint applied in short linear strokes), and washing (paint applied in broad wet strokes). The manner of paint application is often indicative of an artist's training and level of expertise. The painting materials and techniques can help to determine when and where individual images were painted. The cases and frames created for the paintings can also provide significant information.

Condition Problems and Issues with Associated Materials

Over time, and as a result of interaction with the environment, portrait miniatures and their housings develop a variety of condition problems and some distinctive forms of deterioration. Many of these can be identified during visual examination using low magnification and a strong raking light.

Surface Dirt and Mould

A considerable amount of dust and fine dirt can accumulate within portrait miniature cases and frames if the housings were not well sealed. Superficial surface deposits can normally be removed from a painted surface with the aid of a microscope using the tip of a fine soft dry brush. If deposits are tenacious, stronger remedial measures may be necessary, such as using the tip of a scalpel to scale away the harder deposits – again under magnification. As well as being aesthetically displeasing, dirt is a nutrient for mould with which it is often associated. Mould derives nourishment from virtually every material used or found in association with a miniature painting, including mementos made of human hair that were routinely mounted in the backs of miniature lockets. The tight fitting lockets and frames used for housing miniatures can provide microclimates that encourage mould growth, and mould removal is one of the most frequent aspects of basic maintenance (**Figure 5**). The surface characteristics of miniatures are quite varied and will ultimately determine whether or not the removal of mould will leave behind permanent marks or conspicuous staining.

Warped Ivory

The initial condition survey identified warped or cracked ivory supports. Because ivory is hygroscopic, it expands and contracts, at times quickly and dramatically, in response to changes in relative humidity (RH). Ivory supports were routinely adhered to paper or card backings in preparation for painting, and many original backings remain. Differential movement between the ivory, the adhesive and the backing can create stresses leading to damages such as severe warping and cracking. Warped ivory can be relaxed and flattened through controlled exposure to humidity. To humidify the ivory, it can be placed in a closed chamber on a perforated support above a bed of conditioned silica gel.¹² Alternatively, gentle and controlled humidification via Gore-Tex membrane can be applied in a similar manner to that used in paper and paintings conservation.¹³ To facilitate the flattening of a miniature, it may be necessary to first remove any backing paper or card. This can be done dry using a spatula or a scalpel, or through careful, controlled application of moisture. (Further examples are discussed below.)

Cracked Ivory

One of the most dramatic treatments was to the portrait of Captain Walter Patterson (LAC 1989-519) painted in watercolour on ivory ca. 1770 by an unknown artist (**Figure 6**). The original ivory support had fractured into seven separate pieces that were kept together by being glued to a paper backing

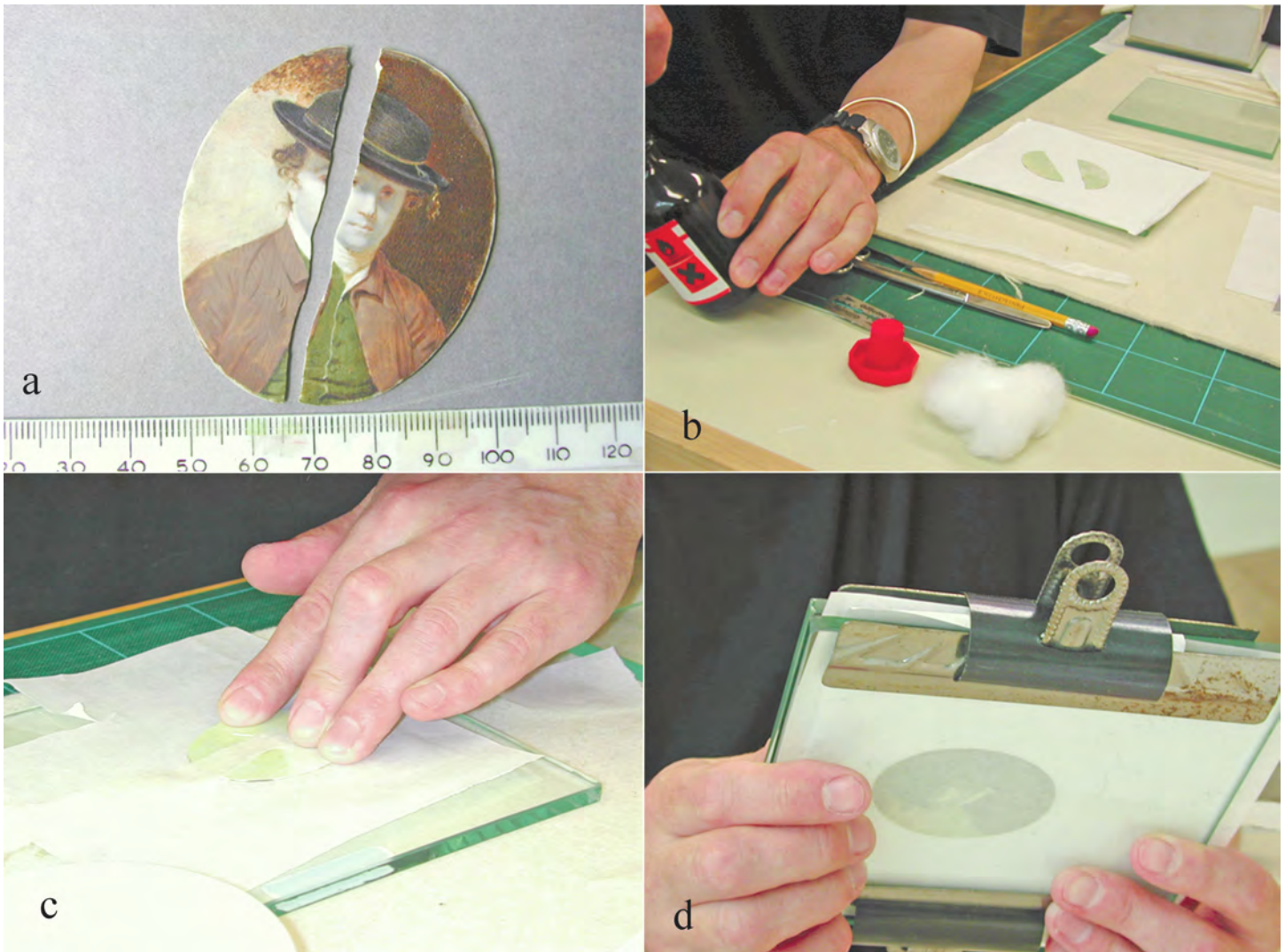


Figure 3. Repair of split ivory: (a) cracked ivory miniature after flattening, (b) degreasing the ivory with swabs of ethanol, (c) repair of crack using Japanese tissue, and (d) repaired miniature allowed to dry between glass plates and silicon release paper. Photos: Alan Derbyshire.



Figure 4. Example of one locket's components. Photo: Alan Derbyshire.

that was added later. The ivory fragments were not flat and had suffered minor paint losses along their break edges. The edges of the sitter's coat had additional paint losses and crazed paint. It was decided to dismantle the portrait then reassemble the ivory fragments. Before the backing paper was peeled off dry and the various pieces of ivory were lifted away, flaking and crazed paint was consolidated with Paraloid B72 (approximately 1% in toluene, application repeated as necessary for consolidation). Acetone was brushed along the edges of each piece to dissolve residual adhesive. The separated pieces were then relaxed and flattened by placing them in a humidity chamber preconditioned with silica gel to 10-15% above the ambient RH. It took approximately five hours for the ivory fragments to relax sufficiently. To reassemble the oval ivory, the pieces were fitted as closely as possible and spot tacked together from the rear with tiny drops of cyanoacrylate adhesive,¹⁴ applied with a needle, to hold the pieces without penetrating the cracks. This adhesive was chosen because it allowed for

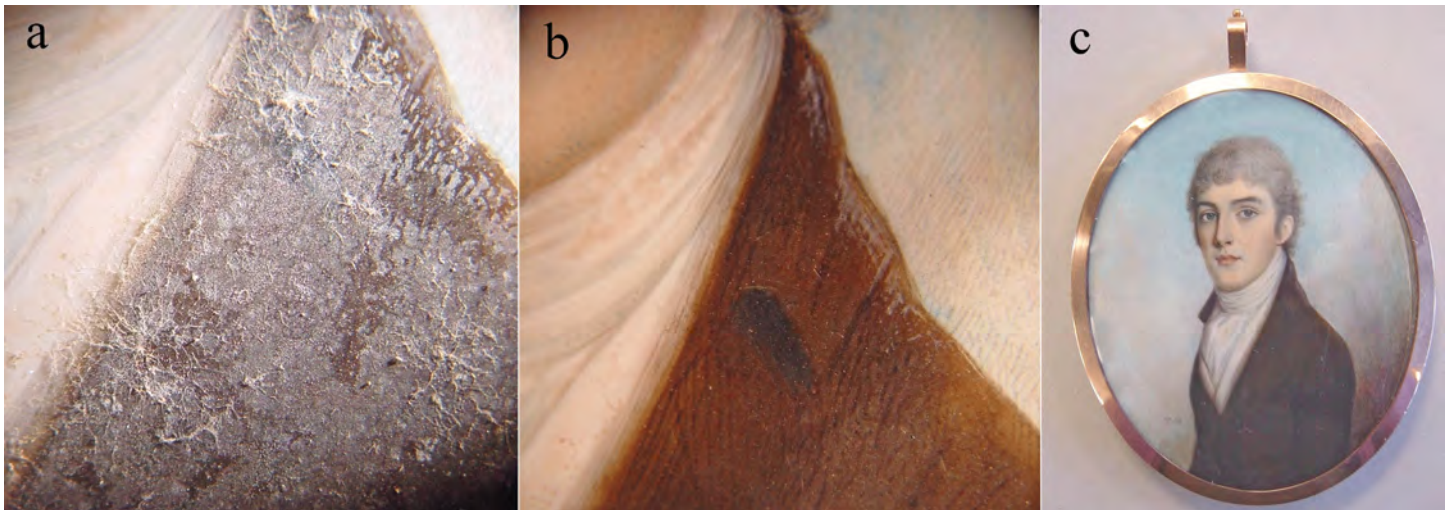


Figure 5. Removal of mould: (a) detail before treatment, (b) detail after treatment, and (c) after treatment. Thomas Hazlehurst, *Unknown Man*, watercolour on ivory, ca. late 18th century, 76 mm x 63 mm (oval), LAC R231-1. Photos: Carol Aiken.

a well-controlled and precise setting of multiple ivory pieces with edges already compromised by the adhesive used formerly. In this case, it was also necessary to mount the repaired miniature on 2-ply rag board for added stability. Spaces between the ivory pieces were filled with a wax/resin mixture (approximately 7 parts beeswax to 2 parts dammar resin), and toned using Bocour Magnacolors (finely ground pigments commercially prepared in an acrylic medium thinned in solvent).¹⁵ (See **Table II** for alternative approaches.)

Paper and Card Backings

In the preceding example, the paper behind the ivory fragments was added during a later repair. It should be noted that paper or card backings were usually applied by the artist as an initial step in the painting process and should not be removed unless considered detrimental to the well-being of a miniature. Every effort should be made to preserve backings in order to maintain the integrity of the object and for future comparative studies. Any

removed original backing should be kept with the miniature.

When a backing paper or card must be removed during treatment, it can sometimes be carefully peeled off, or separated by inserting a scalpel or micro-spatula, or removed using the carefully controlled application of moisture, as was done in the treatment of the portrait of the Hon. John Fletcher (1787-1844) (LAC 1931-212-1) by Charlotte Deming (active 1833-1874) (**Figure 7**). The large rectangular miniature, 107 x 87 mm, was backed by a thin paper inscribed: "Miss C Deming/Artiste/Montreal July/1845" (see **Figure 7b**). The backing contributed to the distortion (cockling) of the ivory support so it needed to be removed before the ivory could be relaxed and flattened. Before initiating treatment, the ink inscription was tested for solubility as well as for iron content, using Fe (II) ion indicator paper test strips.¹⁶ The ink tested positive for iron (II) ions. When applied to the ink line, the indicator paper developed a pink discoloration, showing iron content at 25 according to the CCI Colour Chart, indicating 'noticeable' content of soluble Fe



Figure 6. Repair of cracked ivory: (a) before treatment, (b) during treatment, and (c) after treatment. Unknown Artist, *Captain Walter Patterson*, watercolour on ivory, ca. 1770, 37 mm x 32 mm (oval), LAC 1989-519. Photos: Carol Aiken.

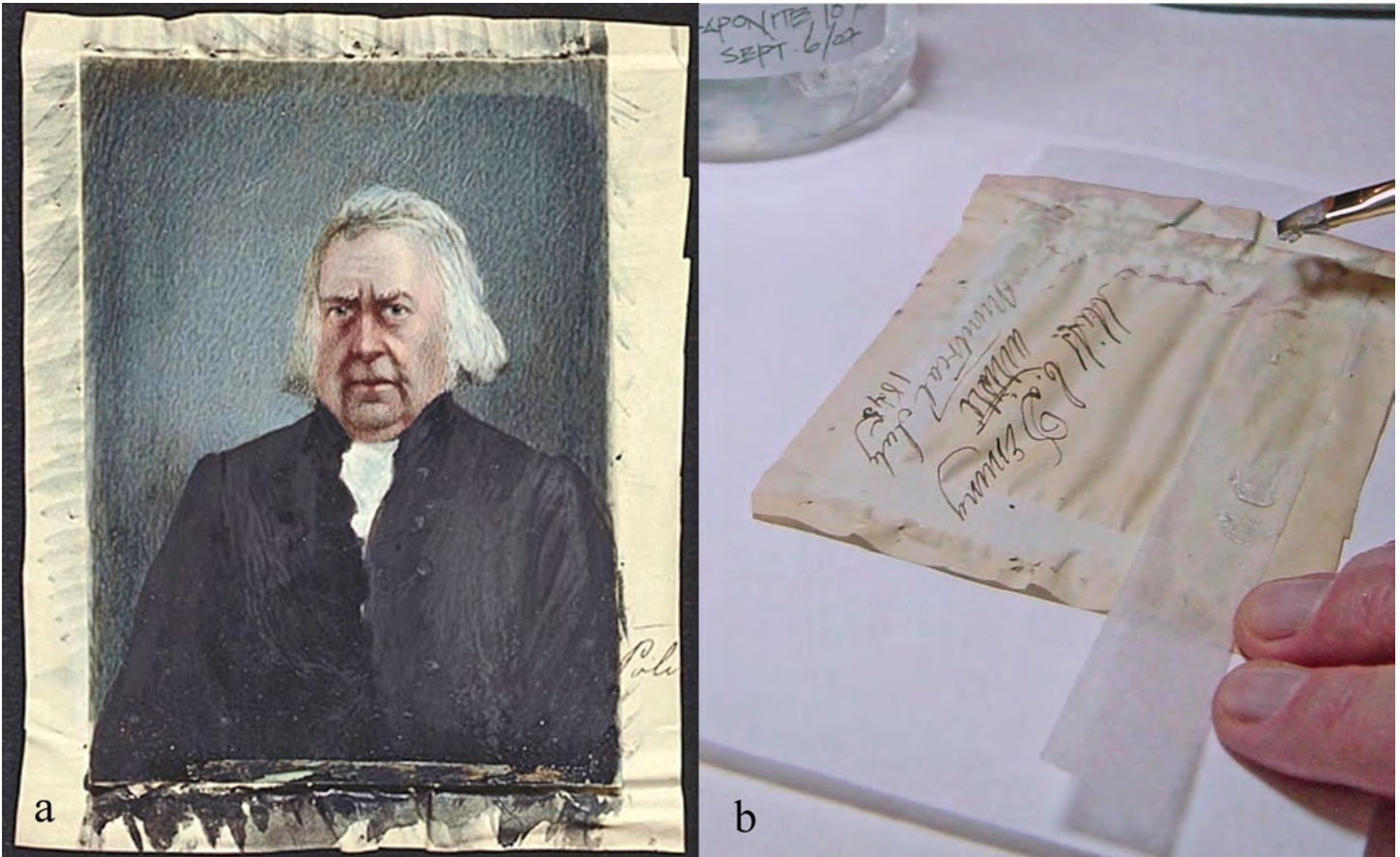


Figure 7. Removal of paper backing from ivory using Laponite: (a) recto; (b) removal of inscribed backing paper using Laponite gel through tissue paper. Charlotte Deming, *Hon. John Fletcher*, watercolour on ivory, 1845, 107 mm x 84 mm, LAC 1931-212-1. Photos: Carol Aiken.

(II) ions.¹⁷ Removal of the backing was achieved through the local application of moisture delivered in a 10% solution of Laponite¹⁸ in purified reverse osmosis (RO) water (weight to volume), applied with a brush through tissue paper (**Figure 7b**). Humidification procedures using silica gel or Gore-Tex were not selected in this situation to prevent the lateral migration of soluble iron ions. The 10% solution of Laponite gel is easily controlled and the amount of moisture that penetrated the paper was minimal. The separated paper backing bearing the iron gall ink inscription was incorporated at the back of the portrait inside a frame. Often a warped paper/card backing needs to be flattened for it to fit back into its locket. In this case, the paper backing was not treated further as the iron gall ink appeared to be stable. Nor was it flattened, in order to retain the evidence of its severely cockled original condition, and to prevent the migration of iron (II) ions outside the ink line during humidification.

Paint Layer

The initial condition survey identified various forms of paint damage. The water-based paints used on miniature portraits remain readily soluble in aqueous solutions. When a painted surface comes into contact with liquid, it can immediately suffer serious damage or even complete destruction. Water may gain entry to a case during a natural disaster or more simply when a case is cleaned with the miniature left inside, leading to areas of

thinned or smeared paint, or total loss of the image. Water entry can also leave disfiguring deposits on the inner surface of a protective cover glass.

One of the more interesting and challenging paint-related treatments was that applied to a profile silhouette of an unknown man by John Miers (1757-1821), painted in black on the bare ivory background of a 52 x 41 mm ivory oval support (LAC 1979-14-9) (**Figure 8**). The ivory was slightly warped. The unusually thick and extremely matte paint layer exhibited small, crater-like depressions, tenting and cleavage (**Figure 8a**). The general appearance of the surface seemed to indicate that it may have been thoroughly wet at some point. The bare ivory background and the painted profile were uniformly soiled. Both surfaces were first gently cleaned using the tip of a soft brush. In preparation for setting down the paint tenting and cleavage, the affected areas of the paint were relaxed by misting with purified RO water via an ultrasonic mister (**Figure 8b**).

Methylcellulose and gelatin were tried for consolidation but both appeared to be too strong and too glossy for this powdery, matte paint layer. The areas were consolidated through multiple applications of a 0.1% Funori solution in RO water, a polysaccharide mucilage made from seaweed, applied with a fine brush under magnification. Following paint consolidation, the ivory support was relaxed and flattened in a humidity chamber

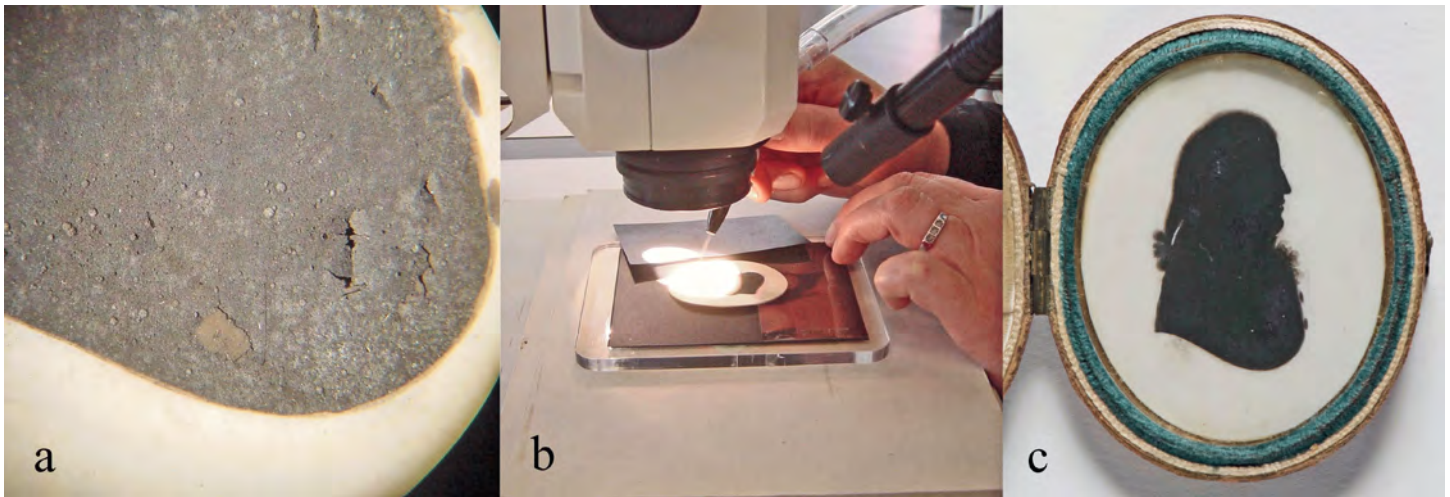


Figure 8. Flaking paint layer: (a) detail before treatment, (b) during relaxation using an ultrasonic mister, and (c) after treatment. J. Miers, *Silhouette*, black watercolour on ivory, 1780-1790, 63 mm x 50 mm, (oval), LAC 1979-14-9. Photos: Carol Aiken and Maria Bedynski.

preconditioned with silica gel to be 10-15% above the ambient RH. Upon removal from the chamber, the ivory was kept in plane between two small sheets of Plexiglas under a thin ragboard mat that prevented direct contact with the paint layer. Light restraint was provided by spring action clothes pins until the ivory equilibrated to the ambient environment and remained flat without restraint. Approximately 48 hours was allowed for this to occur, though this can vary depending on the size or thickness of an ivory, the presence of a backing, and the ambient RH.

The bare ivory around the painted figure was very gently wiped clean with minimally-moistened cotton swabs. Finally, the areas of paint loss on the profile figure were inpainted using powdered ivory black pigment and water, a mixture that was selected to achieve a suitably matte surface finish (**Figure 8c**).

Blackening of Lead White

Another treatment addressed tiny black spots of discoloured white lead that disfigured the face of an unknown elderly woman (LAC 1995-09-15), painted in 1793 by William Grimaldi (**Figure 9**). The spots were originally applied as highlights but had since discoloured due to the oxidation of basic white lead carbonate to black lead sulphide. A reversal of the discoloration was accomplished, working under magnification, by brushing the spots with a 1:1 solution of hydrogen peroxide in ether. An alternate method for treatment of blackened lead white is the introduction of hydrogen peroxide via Gore-Tex (see **Table I**). However, in this case it would have been too difficult to localize the effects due to the extremely small size of blackened lead white spots.

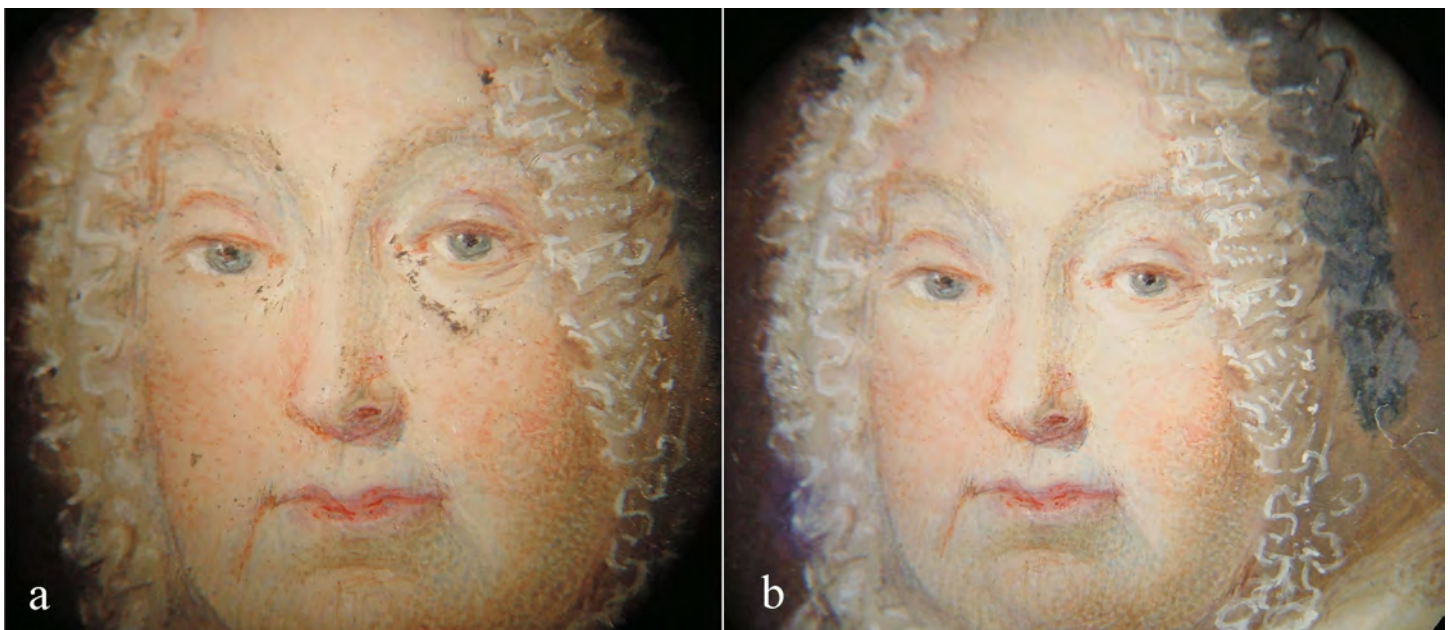


Figure 9. Blackened white lead: (a) detail before treatment and (b) detail after treatment. William Grimaldi (1751-1830), *Unknown Woman*, watercolour on ivory, 1793, 59 mm x 50 mm, (oval), LAC 1995-09-15. Photos: Carol Aiken.



Figure 10. Example of a protective box for the long term storage of the miniature shown in **Figure 5**. Photo: Maggie McDonald.

Glass

During the initial collection survey, some of the problems noted were associated with the cases and frames of miniatures, as well as with their convex glass coverings. The condition of the glasses ranged from dirty to abraded and scratched. The dirty glasses were removed from their case or frame and cleaned on both sides with water, then carefully dried before being remounted. Glass surfaces that are abraded or scratched can be safely and successfully polished to regain their original clarity and surface perfection by an experienced glassworker, such as an optician or glass artist, and then reused. Unfortunately, some glasses covering miniatures are inherently unstable due to chemical imbalances in the original glass mixtures, leading to different manifestations of deterioration. The wet forms of deterioration may lead to spotting, staining or losses to the painted surfaces of the miniatures. Dry forms of deterioration can lead to the development of surface films that may become so opaque as to obscure the image. In general, an unstable glass should be replaced to ensure that the painted surface it covers is not damaged or visually compromised. Unstable glasses are identified by a variety of characteristic symptoms ranging from wet droplets and misty surface films to overall surface flaking or fissure formation. All of these features become more apparent when viewed with a raking light.

Covering glasses can be cleaned using swabs of 50:50 water and ethanol, or for very dirty glass, warm water with a non-ionic surfactant such as Dehypon LS45. Glasses should only be cleaned once the case has been opened and the glass is separated from the miniature.

Cases and Frames

Damaged cases and frames, or those containing poor quality materials, can sometimes have a direct, negative impact on the miniature portraits. If it is determined that a new or replacement housing is required, the original presentation or housing should be retained. Original backings, cases and frames may provide invaluable information for interpreting the miniature and may help to suggest or affirm attributions. When framing a miniature that lacks housing, or when changing an existing housing, materials and methods must be selected with care and with an understanding of the special requirements of the ivory supports. Poor quality materials that can generate potentially damaging or disfiguring deterioration products should be avoided, as should poor methods of framing that can lead to direct physical damage. In a situation that permits the retention of associated materials, including frames and frame parts, all the pieces can be housed together and accommodated in trays within one larger box.

Some metal locket and frames can be cleaned using swabs dampened with saliva followed by swabs of ethanol. Abrasive metal polishes of any type should be avoided, as they may lead to loss of delicate surface platings, some worn from years of handling and former cleanings. Lockets or frames should only be cleaned once the painted miniature has been removed.

Conclusion

Since the completion of the portrait miniature project at LAC in November 2007, several additional miniatures in the collection have been treated. The principles learned during the workshop

and treatment phase were put into practice. Carol Aiken evaluated the results of some of these treatments at the Preservation Centre in May 2008. Of the one hundred portrait miniatures selected for the survey, a total of fifty-five have been successfully treated. A number of miniatures have unresolved framing and glass issues: some frames need repair or modification while some portrait miniatures without frames require suitable frames. A few portraits with deteriorating or broken glasses await replacement, and several severely damaged miniatures will require extensive treatment. For the time being, however, all the miniatures are well protected in individual storage boxes (**Figure 10**), and the collection is now in its best condition ever, due to the work made possible through the generous contribution of a grant from the Getty Foundation.

The project has resulted in greater access to miniatures for study, reproduction, exhibition and loan. Detailed examinations of the portrait miniatures before and during the treatments provided valuable information about a number of pieces, such as inscriptions, signatures and marks. In some cases, these new insights led to revised attributions. Select features will become subjects of future scholarly research, while some have already led to revisions in catalogue entries and bibliographies. Since 2007, three miniatures were loaned for exhibition¹⁹ and others are being considered for upcoming exhibitions.

Public access to LAC portrait miniatures for viewing and research is by appointment only and is supervised. Prior to viewing the originals, intellectual and historical documentation is provided to the researcher by an art archivist. Supplementary lighting and magnification is made available to facilitate viewing. Gloves must be worn at all times by researchers. Because of the acute sensitivity of portrait miniatures to environmental conditions, LAC portrait miniatures are examined only in the art vault within a very stable environment of 18 degrees Celsius and 50% RH. Only under exceptional circumstances would a work be removed for further examination in the conservation laboratory.

The authors hope that this project has contributed to increasing the level of knowledge, expertise and collaboration in the care and treatment of portrait miniatures, and that these complex and beautiful objects are more accessible and appreciated by viewers.

Acknowledgements

This project was originally conceived by Gilbert Gignac, former Collections Manager of the art collections at Library and Archives Canada and was made possible through the generous support of the Getty Foundation. The authors would also like to thank the following institutions and individuals for their support, collaboration and advice: Library and Archives Canada and Portrait Gallery of Canada program; Victoria & Albert Museum; Canadian Conservation Institute; Queen's University Art Conservation Program; National Gallery of Canada; British High Commission; Mary Murphy, Janet Kepkiewicz, Elizabeth Jaquish, Wanda McWilliams and Maggie McDonald of Library and Archives Canada; Helen McKay of the Canadian

Conservation Institute; Barbara Klempan of Queen's University; and Norman Paul, independent photography specialist.

Materials

Note: Some materials used in the described treatments are no longer commercially available. If the source for a material cannot be identified, information is provided to assist in seeking acceptable alternatives.

Aerosol Generating System AGS 2000, Ultrasonic Mister:
ZFB Zentrum für Bucherhaltung. GmbH, Mommsenstrasse 6, D-04329 Leipzig, Germany.
Phone: 49 (0) 341 25989-0
Website: <http://www.zfb.com/en_version.php>.

Artcare Colours:
ArtCare, P.O. Box 55939, London, W11 2UJ United Kingdom.
Phone: +44020-7313-9674
Website: <<http://www.artcare.org/>>.

Bathophenanthroline Fe (II) indicator paper:
Archival Products.ca (division of B.F.B Sales Limited)
2957 Inlake Court, Mississauga, ON, L5N 2A4, Canada.
Phone: 905-858-7888 or 800-667-2632
Email: info@archivalproducts.ca
Website: <<http://www.archivalproducts.ca/>>.

Beeswax:
Talas, 330 Morgan Ave, Brooklyn, NY, 11211, USA.
Phone: 212-219-0770
Website: <<http://www.talasonline.com/>>.

Bocour Magnacolors:
(See endnote 15.)
Alternatives to Bocour Magnacolors are paints made by Gamblin and Lascaux: <<http://www.gamblincolors.com/>>, <<http://lascaux.ch/en/index.php>>. Water-based paints are not suitable for inpainting or retouching portrait miniatures.

Convex glasses and reproduction frames:
R.J.W. Products, 1 Georgian Place, Hayes, Bromley London BR2 7A, England.
Phone: 0044 208 462 6466.
Email: r.wood920@ntlworld.com
also:
Wiebold Studio, Inc., 413 Terrace Place, Terrace Park, OH 45174, USA.
Phone: 513-831-2541 or 800-321-2541
Email: conservator@wiebold.com
Website: <<http://www.wiebold.com/>>.

Cyanoacrylate Adhesive:
(See endnote 14.)
Scotch Super Glue Liquid 3M
Website: <http://www.scotchbrand.com/wps/portal/3M/en_US/ScotchBrand/Scotch/>.

Dammar Resin:
Talas (as above).

Dehypon LS45:
Conservation Resources International, LLC, 5532 Port Royal Road, Springfield, Virginia 22151, USA.
Phone: 703-321-7730 or 800-634-6932
Email: sales@conservationresources.com
Website: <<http://www.conservationresources.com/>>
also:
Conservation By Design Limited, Timecare Works, 5 Singer Way, Woburn Road Industrial Estate, Kempston, Bedford MK42 7AW, UK.
Phone: (01234) 846300.
Email: info@conservation-by-design.co.uk
Website: <<http://www.conservation-by-design.co.uk/>>.

Funori:
Talas (as above).

Gamblin Conservation Colours:
Talas (as above).

Gelatin:
Gelatin Innovations Inc. 5024 Rose Street, Schiller Park IL 60176, USA.
Phone: 847-678-4708
Email: sales@gelatininnovations.com.
Website: <<http://www.gelatininnovations.com>>.

Gore-Tex barrier polyester felt laminate or polyester nonwoven laminate:
Discontinued; Sympatex is now sold as an alternative to Gore-Tex.
Carr McLean, 461 Horner Avenue, Toronto, ON M8W 4X2, Canada.
Phone: 416-252-3371 or 800-268-2123
Email: sales@carrmclean.ca
Website: <<http://www.carrmclean.ca/>>
also: Archival Products.ca (division of B.F.B Sales Limited) (as above).

Iron (II) test strip colour chart:
(See endnote 17.)
Canadian Conservation Institute, 1030 Innes Rd., Ottawa, ON, K1A 0M5, Canada.
Phone: 613-998-3721, please contact Season Tse (extension187 or season.tse@pch.gc.ca).

Laponite RD:
(See endnote 18.)
Talas (as above).

Lascaux Acrylic Adhesives:
Talas (as above).

Methyl cellulose - Methocel MC, low viscosity 330 - 550 mPa.s:
Fluka Chemie AG, Industriestrasse 25, 9471 Buchs, Switzerland.

Phone: 081/755 25 11 or 155 66 33 (toll free)
Email: webmaster@sial.com
Website: <http://www.sigmaaldrich.com/catalog/ProductDetail.do?lang=en&N4=64620|SIGMA&N5=SEARCH_CONCAT_PNO|BRAND_KEY&F=SPEC>.

Mowilith DMC2, Mowilith 20:
Discontinued; Evacon-R (Water soluble, non plasticised, pH 7.5, Ethylene - Vinylacetate Copolymer Emulsion) is a suitable alternative.
Conservation By Design Limited (as above)

MS2A (a ketone resin):
Talas (as above).

Paraloid B72:
Talas (as above).

Silica Gel:
(See endnote 12.)
PDF product information is available for grade 59 silica gel at: <<http://www.coastalchem.com/PDFs/Grace%20Davison/Silica%20Gel%20Grade%2059>>. Accessed March 2011.

Notes and References

1. Queen Elizabeth I was known to wear miniature portraits of her favourites. Queen Victoria is depicted wearing bracelets composed of miniature portraits of her children and one of Prince Albert. Queen Elizabeth II is often photographed on state occasions wearing portrait miniatures of her mother and father. An example from LAC's collection is the 1846 watercolour portrait of Lady Aylmer, wife of Vice Admiral Lord Aylmer, by J. Carpenter (LAC, Acc. No. R11039-2): Lady Aylmer is depicted wearing a bracelet containing a miniature portrait.
2. Atherton, William Henry, *The Saintly Life of Jeanne Mance – First Lay Nurse in North America* (St Louis, MO: The Catholic Hospital Association of the United States and Canada, 1945), pp. 16-17: “*She probably gave Jeanne on that occasion ... a miniature portrait of the “Unknown Benefactress”, framed in gold and encircled with fine pearls in a box of fine agate.*”
3. Informal survey conducted by Gilbert Gignac, former LAC Art Collection Manager, 2003.
4. Gignac, Gilbert L., “Look here upon this picture,” *The Archivist*, vol. 13, no. 5, September-October, 1986, p. 8.
5. LAC's collection has no miniature portraits painted on a vellum support. The earliest miniature dates from the late 17th century and is painted on porcelain. Most LAC miniatures were painted later, after the transition from vellum to ivory supports. Nonetheless, vellum is discussed because other decorative art collections in Canada have important miniatures painted on vellum.

6. Huneault, Kristina, "Miniature Objects of Cultural Covenant: Portraits and First Nations Sitters in British North America," Concordia University, *RACAR* / XX, 1-2 / 2005, pp. 87-100. Also: Vallée, Anne-Élisabeth, "L'intérêt et les limites de la recherche sur l'art de la miniature au Canada. La collection de Bibliothèque et Archives Canada," Université du Québec à Montréal, *RACAR* / XXX, 1-2 / 2005, pp. 59-73.
7. Klempan, Barbara, *Summary Report and Conservation Survey on the Miniature Collection of the National Archives* (Ottawa, 1985). Unpublished report.
8. For a succinct introduction to these topics, see: Aiken, Carol, "Literature that addresses the characterization and the conservation of portrait miniatures," *Reviews in Conservation*, vol. 1, 2000, pp. 3-9.
9. Derbyshire, Alan, Nick Frayling, and Cecilia Ronnerstam, "Developments in the field of portrait miniature conservation," *Restauratorenblatter*, Band 21, 2000, pp. 53-59.
10. Derbyshire, Alan and Timea Tallian, "The new Miniatures Gallery," *V&A Conservation Journal*, no. 51, Autumn 2005, pp. 2-4.
11. Derbyshire, Alan and Robert Withnall, "Non-Destructive Pigment Analyses using Raman Microscopy," *V&A Conservation Journal*, no. 30, January 1999, pp. 9-13.
12. A non-decrepating grade of silica gel (Grace Davison 59) was used to control the RH in the humidification chamber. Non-decrepating gel does not readily disintegrate on direct wetting with water, permitting the RH in the closed chamber to be raised with relative ease by directly spraying the crystals with de-ionized water. See: Stolow, Nathan, "Silica gel and related RH buffering materials, conditioning and regeneration techniques," in: *Care of Collections*, edited by Simon Knell (NY: Routledge, 1994), pp. 93-100.
13. Derbyshire, Alan, "The Use of Goretex in the Flattening of Miniatures on Ivory," *Paper Conservation News*, no. 63, 1992, p. 13.
14. Commercially available cyanoacrylate adhesives have a wide range of working properties. The selection of a specific product should be based on the requirements of the treatment in which the selected adhesive will be used.
15. In 1949 Leonard Bocour offered a limited range of acrylic paints marketed under the name Magna, and several generations of conservators subsequently relied on the fast-drying solvent-soluble colours for inpainting. Although no longer made, tubes of Bocour Magnacolors can sometimes be purchased on eBay or found in the drawers of conservation studios. The dried paint remains solvent soluble, and palettes of Bocour colours continue to be a preferred inpainting medium for portrait miniatures.
16. Neevel, Johan Gerrit and Birgit Reissland, "Bathophenanthroline indicator paper: development of a new test for iron ions," *Paper Restaurierung*, vol. 6, no. 1, 2005, pp. 28-36.
17. The colour chart developed at the Canadian Conservation Institute (CCI) can be used to estimate and record changes in iron (II) ion concentration before, during and after conservation treatment – not for quantitative determination. It is available by contacting CCI. See: Guild, Sherry, Season Tse and Maria Trojan-Bedynski, "Treatment Options for Iron Gall Ink on Paper: A Flow Chart for the Decision-Making Process," (forthcoming). Also: Vuori, Jan and Season Tse, "A Preliminary Study for the Use of Bathophenanthroline Iron Test Strips on Textiles," in: *ICOM Committee for Conservation, ICOM-CC 14th Triennial Meeting, The Hague, 12-16 September 2005: Preprints*, edited by Isabelle Verger (London: James & James, 2005), pp. 989-995.
18. Laponite is a synthetic inorganic layered silicate material that is dispersed in water to form a clear, thixotropic, colloidal gel that is used as a poultice in conservation to remove dirt and soften adhesives. Laponite website: <<http://www.laponite.com/>>. See also: Totten, Andrea M., "Laponite residues on paper and parchment," *The Paper Conservator*, 2003, vol. 27, pp. 23-34.
19. William Charles Ross, *Katherine Jane Ellice*, watercolour on ivory, ca. 1841, LAC 1987-97-1; Lady Henrietta Martha Hamilton, *Demasduit (Mary March)*, watercolour on ivory, 1819, LAC 1977-14-1; Franz Xaver Winterhalter, *Queen Victoria*, watercolour on ivory, execution date unknown, LAC 1959-1-6.