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Jonathan Ashley-Smith — Editorial

Fi Jordan — Review of Consolidation of Painted Surfaces Workshop

Bridget Mitchell — The Novels of Charles Dickens: Bound to Last?

Alan Derbyshire, Richard Withnall — Non-destructive Pigment Analysis Using Raman Microscopy

Anna Hillcoat-Imanishi — The Archival Properties of Colour Photocopies and Inkjet Prints

Alexandra Kosinova — Review of 24th Annual Conference of the Canadian Association for Conservation of Cultural Property

Science and Information Section — Science Surgery

RCA/V&A Conservation Course Abstracts

New Staff

Conservation Department Staff Chart

Contents

V&A Conservation Journal No 30

3 Editorial - Change, Access and Permanence
Jonathan Ashley-Smith, Head of Conservation

4 Consolidation of Painted Surfaces. A Workshop led by Sandra Grantham, 11 September 1998
Fi Jordan, Senior Ceramics Conservator, Ceramics & Glass Conservation

5 The Novels of Charles Dickens; Bound to Last? The Structural Evolution of a Manuscript's Bindings
Bridget Mitchell, Books Conservator, Books Conservation

9 Non-destructive Pigment Analysis Using Raman Microscopy
Alan Derbyshire, Senior Paper Conservator, Paper Conservation
Robert Withnall, Senior Lecturer, University of Greenwich

14 An Investigation Into the Archival Properties of Colour Photocopies and Inkjet Prints; Summary of Project Undertaken At Camberwell College of Art As Part of a BA in Paper Conservation, Spring 1996
Anna Hillcoat-Imanishi, Graduate of RCA/VA Conservation Course 1998

17 Review of the 24th Annual Conference of the Canadian Association for Conservation of Cultural Property in Whitehorse, Yukon, 27-29th May, 1988
Alexandra Kosinova, Sculpture Conservator, Sculpture Conservation

18 Science Surgery
Science and Information Section, Conservation Department

19 RCA/V&A Conservation Course Abstracts

23 New Staff

24 Conservation Department Staff Chart

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The cover shows participants at the first workshop organised by the Communications Group
Photography by Michael Wheeler

Editorial – Change, Access and Permanence

Jonathan Ashley-Smith
Head of Conservation

The fundamental principle of conservation is to slow or stop the process of change. To predict the state of things in the future you need to know the present position, the causes of change and the rate at which change is likely to take place. The processes of change that directly affect objects can be very slow. Yet the changes within the conservation profession that affect those in work or looking for work are currently quite rapid. If you study the staff charts printed on the back page of issues of this journal over the past seven years you will see how external factors have continued to effect the size, structure and composition of the Department. Changes in non-Nationals and Area Museum Services have been much more dramatic. The dominant external factor has been the funding strategy of government, unchanged with the change of administration.

The present government has placed great emphasis on "access". At one time conservators might have thought that the greater emphasis of their job should be on preservation, but now organisations seeking government funds are explicitly demanding an involvement in access. Recent advertisements for conservation posts have contained phrases such as: "The successful candidate will demonstrate a commitment to increasing access to collections..." and " ...is required to suggest improvements for access to collections". Recent issues of this Journal have concentrated on the Department's involvement with traditional means of access through display in exhibitions and new galleries, as well as through the use of new technologies to allow greater appreciation of small and delicate objects such as portrait miniatures. Often forgotten, and frequently less glamorous, is the conservation work necessary to allow access to objects in print rooms and reading rooms. The rebinding of the Dicken's manuscripts described in this issue indicates the amount of thought and practical work necessary to combine access with long term preservation.

Another wish of government is that museums should form useful collaborations. In the area of conservation research this has been a long tradition. The report on the use of the portable laser Raman spectrometer to analyse the pigments in miniatures is a further example. Other articles deal with permanence; permanence of sources of information such as photocopies; permanence of the effect of treatment.

Permanence of employment, although not entirely a thing of the past, is certainly on the decline. The number of "permanent" conservators at the V&A has dropped by 15%. A recent development is the invitation to tender, not only for specific projects, but for blocks of time to carry out duties that would previously have been the responsibility of permanent staff. If that method is to increase, then the Conservation profession's recent move towards accreditation, assuring defined levels of competence, is very timely.

Review:

Consolidation of Painted Surfaces. A Workshop led by Sandra Grantham, 11 September 1998

Fi Jordan
Senior Ceramics Conservator, Ceramics & Glass Conservation

The practical workshop, organised by members of the Communications Group, gave Sandra Grantham a forum in which to explain and demonstrate the application of a misted consolidation system developed during research for her PhD thesis. The successful consolidation of friable materials presents a constant challenge to every conservation discipline. Therefore, it was no surprise that the workshop created widespread interest . Although its ten places soon filled up, there was room on the day for a group of 'non-participating' observers. In order to benefit fully from the workshop, it was necessary for the participants to prepare themselves in advance. The organisers provided relevant literature in the form of articles and product information and each discipline prepared facsimile samples and brought aqueous consolidants to experiment with.

Photography by Mike Wheeler.

Figure 1. Experimenting with a method of applying consolidant using the nebulizer.

Study of the articles provided gave the participants a knowledge of previous consolidation application methods. Sandra was therefore able to focus directly on her research into the consolidation of powdery and flaking paint on Japanese screens. She briefly explained her criteria for choosing a consolidant and how the technique was developed. This was followed by a demonstration of the misted consolidant applied to degraded paint layers on humidified paper samples. A small air pressure nebulizer ('Pariboy'™) , used to administer antibiotics in solution to patients, was used to deliver a mist of a chosen consolidant solution to an object within a humidity chamber. From its hose attachment a very fine mist, with 65% of the moisture droplets below 5 microns in size, can be applied gradually to the object with the intention of causing less disturbance to loose particles than a brush or spray application and with little or no colour change. The use of the consolidant on an already humidified object is essential if minimum colour change is desired. The relative humidity was maintained at 69% RH in the chamber during the application of the consolidant.

Having seen this successful application, it was then our turn to experiment on our samples. These included unstable bound or unbound pigments on porous and non-porous substrates (such as pastels on paper, painted wood, vellum, silk, terracotta and glass, gilded surfaces and degraded velvet). Consolidants of different concentrations were tested including methyl cellulose and gelatine. The results, and success, of our tests varied considerably. Sandra guided us through our initial attempts suggesting modifications or alternative methods where appropriate. Some disciplines, notably the Textile Section, enjoyed greater success with the technique than others.

After the practical session we shared our initial findings and knowledge of different surfaces and conservation problems. The informality of the session lent itself to a welcome exchange of currently held views and ideas including a discussion into the use of overall versus localised consolidation methods. We were all able to benefit from sharing in a colleague's area of particular expertise and contribute to a valuable interchange of information between disciplines and the RCA/V&A Conservation Course. Small group workshops provide valuable training in the development of practical skills and this session was a thought provoking, informative and enjoyable learning opportunity.

The Novels of Charles Dickens; Bound to Last? The Structural Evolution of a Manuscript's Bindings.

Bridget Mitchell
Books Conservator, Books Conservation

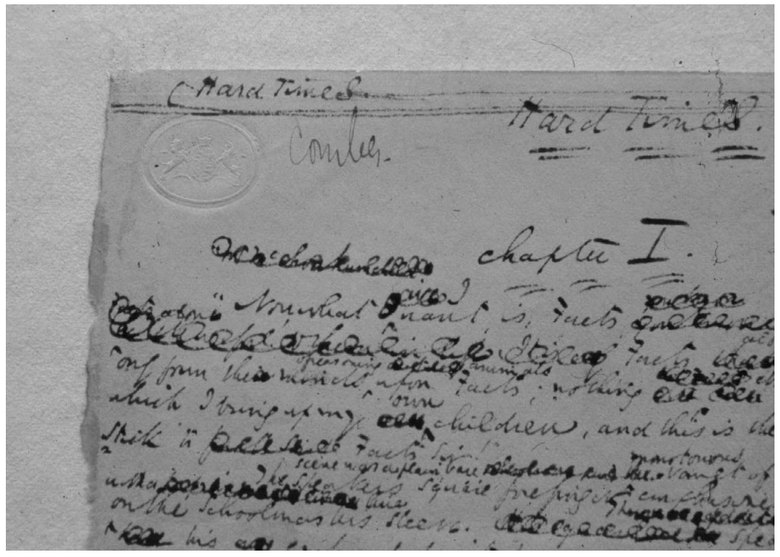
The National Art Library at the Victoria and Albert Museum holds the manuscripts of 12 of the novels by Charles Dickens. A condition survey carried out by the Book Conservation Section in 1991 identified these 38 volumes as amongst the most valuable items at greatest risk. The resulting treatment initiated to stabilise the physical condition of the manuscripts is the third binding the leaves have undergone in approximately 125 years[1]. The manuscript leaves were written over a period of 33 years, from Oliver Twist in 1837 to Edwin Drood, which remained unfinished on Dicken's death in 1870.

This paper will aim to trace the physical and structural development of the manuscripts from the visual clues that still remain, as a means of illustrating some of the preservation concerns of the different generations responsible for their care.

From visual clues it is possible to deduce Dickens's working method. Dickens wrote his novels in iron gall and/or blue ink on one side only[2] of single sheets of good quality, handmade, writing paper. Consistently two types of paper, probably cotton rag, were used for the main body of the text[3], and were originally purchased as folds of paper. He would tear between one and five sheets down the centre crease, place one pile on top of the other and commence writing. We know this because the cleanliness of the torn edge indicates that he tore the paper prior to writing on it. His writing method is very consistent throughout all the novels. He began the text at the very head of the page and covered almost the entire sheet in script leaving no margins, so to tear the sheet after completion would threaten a great deal of work.

The physical nature of the leaves indicates Dickens had a good knowledge of the printing and publishing process. The sheets bear much evidence this: inky thumb prints, printers' names. Writing on only one side of the sheet made for easy division of the text amongst the compositors. The leaves have been cut or torn for distribution amongst the men. This physical evidence would seem to indicate that once the sheets were set to type, the manuscript version had little significance for the printers.

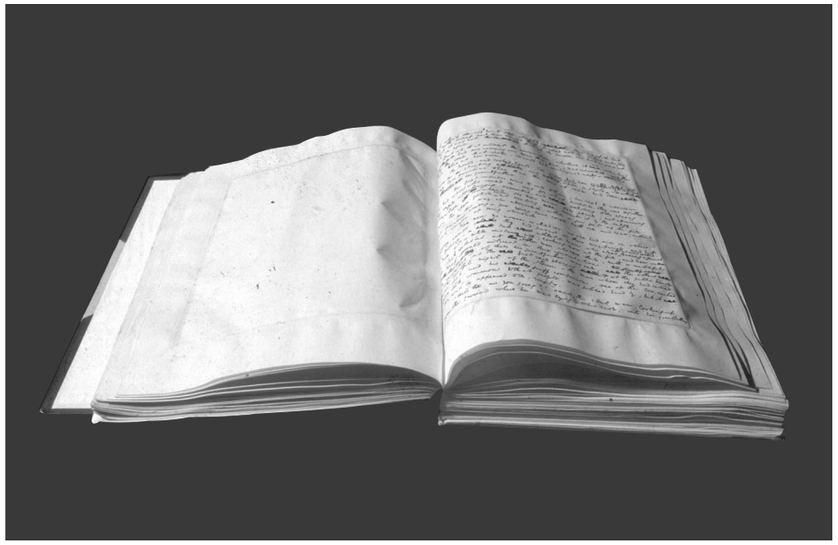
This was not the case however for Dickens and his lifelong friend John Forster to whom he bequeathed the manuscripts. There is little documentation concerning the first binding of



Photography by Annette Low

Figure 1 Hard Times manuscript leaf showing paperstamp and printers name (Combes).

the manuscripts, so all the information stems from the visual clues found within the binding remnants. The manuscript leaves were mounted onto folds of pre-cut, thin, handmade paper by the application of adhesive to each vertical edge. The reverse of the manuscript leaf was completely obscured by this thin support sheet. The support sheet is approximately the same size as the manuscript leaf but slightly wider at the spine margin to provide an excess for use in binding. Sewn on recessed cords with a tube hollow and laced on boards, the binding was half covered with brown calf skin and marble paper sides.



Photography by V&A Photographic studio

Figure 2a 1960s binding showing severe cockling.

Forster bequeathed the volumes to the South Kensington Museum, where they arrived after his death in 1876. It is unclear what prompted the Museum to undertake the complete rebinding of the 20 ms. volumes into 38 new volumes 90 years later . Documentation does not establish just how degraded the bindings had become. The purpose of this second binding seems to have been to provided a handling edge – an extension of paper around the leaves by which the pages could be turned without direct handling – even though there are no signs of readership damage.

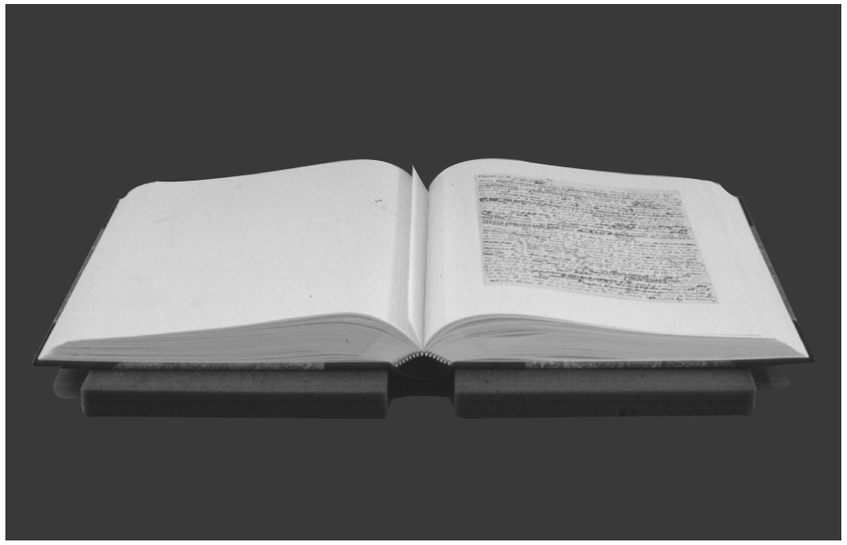
For the second binding the Victorian binding was pulled and the manuscript leaf with its attached support leaf were removed and adhered, as one, into a frame of medium weight machine made paper. The framing paper was prepared in folds with one manuscript leaf and its attached support sheet to each leaf of the fold. The folds, with the manuscript leaf in position were then pressed, gathered into sections and sewn through the spine bolt onto recessed cord sewing supports. The binding has a tube hollow and is half covered in brown goat skin with cloth sides.

As a direct result of this rebinding and the methods used to mount the leaves, severe tension and cockling was set up across the face of the ms. leaf. Where these tensions coincided with areas of the ms. paper already weakened by iron gall ink acids, the paper was forced to split when the pages were turned, and in severe cases losses occurred. The bindings themselves were still in near perfect condition and showed no signs of deterioration either chemical or physical.

The categorisation of these items as unstable, in the "100 Best survey" in 1991[4] prompted the setting up of a project to treat and rehouse all 38 volumes of the 12 novels. A treatment, it is envisaged will ensure the manuscripts remain protected for the foreseeable future. A comprehensive and well constructed approach to both the binding and mounting method will, it is hoped, provide a stable environment within which the rate of deterioration both physical and chemical is reduced to a minimum.

A comprehensive description of the individual treatments involved in the Dickens project can be found in previous documentation.[5]

The starting point for the rebinding of the manuscripts was a structural and condition survey of all the 6,184 leaves closely examining all the deterioration they had suffered. An assessment of the extent of that damage and the likelihood of further deterioration under any new conditions imposed on the leaves helped to form the treatment proposal.



Photography by Bridget Mitchell

Figure 2b 1990s binding.

The major causes and types of deterioration were found to be:

- Low pH and weakening of the paper fibres in the inked areas. Chemical deterioration.
- Lowering of the overall pH of the ms. leaves particularly in those areas discoloured by proximity to inferior quality materials eg adhesives, low grade paper. Chemical deterioration.
- The aggravation of the ink-weakened areas by the cockling, resulting in splitting and loss of ms leaf. Physical deterioration.

Of these three factors, the physical damage caused by the tension in the leaves was judged to be contributing most to the manuscripts' deterioration. Rectifying this would make the major contribution towards creating stable conditions for prolonged access to the manuscripts.

The decision to rebind the manuscripts again in volume format was considered to be the most comprehensive way of achieving suitable conditions. Several other options were assessed but eventually rejected.

The 1990s conservation rebinding is similar in appearance and structure to those it succeeds. Choice of materials and structural style was specific with regard to necessary function of the volumes. Half bound in red goat skin with marble paper sides, they draw heavily on the appearance of the first binding. The sections comprise three folds of buffered 160gsm Rag Endleaf paper, sewn all-along on four evenly spaced linen tape supports. Tape supports and a tube hollow spine allow the pages to lie flat when the book rests open.

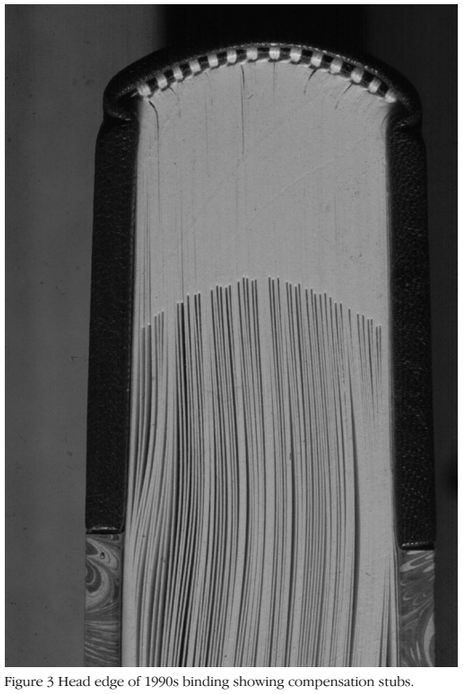
The ms. leaves were parted from their original support leaf and removed from the 1966 binding, and humidified using damp blotters in a Gortex sandwich to remove the cockles. Treatment of the leaves was kept to a minimum and no attempt was made to arrest the chemical deterioration for fear of endangering important bibliographic evidence. Areas of paper severely weakened by ink acids were physically supported with methyl cellulose in IMS and buffered Japanese tissue.

The new blank text blocks were assembled and bound. The handwritten leaves were mounted onto the blank support leaves by folded Japanese tissue guards which run the entire length of the leaf spine edge. An appropriate number of blank support leaves had been incorporated into the new binding and were cut from the text block as the leaves were secured to compensate for the added bulk of the manuscript (see figure 3). Sufficient margin around all four sides of the ms. leaves ensure that there is no need to handle the leaf directly when turning the page. The wide spine margin guarantees that the new support page, not the ms. leaf, bares the strain of flexing when the when the book rests opened. Japanese tissue corner straps ensure that the leaf is held firm and supported at all times during reading.

The enclosure of the leaves within a stable environment was felt to provide optimum conditions for long term care, so the bindings are housed within permanent drop-spine book boxes lined with MicroChamber® paper; designed to absorb atmospheric pollutants. The previous bindings had shown little signs of wear to the

leather and the combination of pollutant free environment and restricted reader access is felt to be sufficient precaution against rapid breakdown of the leather covering.

Each of the bindings is a product of its time and demonstrates the preservation and conservation concerns of each individual and era that has been responsible for their care. From the physical clues within the remaining binding structures it is possible to surmise much about the type and function of the objects and hypothesise about the concerns that prompted those structures. But it also leaves many questions unanswered. For instance; what prompted the choice of binding structure for the original binding? Was the use of a support sheet some kind of barrier against the corrosive qualities of the iron gall ink, or were the inadequacies of the alternative structures, such as guard books, already recognised? Were the similarities between the first and second binding intentional? Why did the second binding treat a damage type (handling damage) that from the evidence does not appear to have caused much damage. Was there an assumption that damage was something that happened *to* an object rather that being inherent *within* it?



Photography by Bridget Mitchell

Figure 3 Head edge of 1990s binding showing compensation stubs.

It is hoped, now the profession has reached a level of maturity, that the careful selection of quality materials and appropriate mounting and binding techniques will enable the manuscripts to bear the inevitable demands of readers, exhibitions and digital information recording without the need for any further interventive treatment. As the previous two bindings are consigned to a storage box, their connection with the leaves becomes more tenuous; information and memories are lost and binding fragments become degraded. Recording the details of the bindings from this primary evidence, by observation, where no previous documentation exists, becomes a responsibility even if that documentation is restricted by the concerns of the age in which it is made.

This article is an abridged version of a paper presented at the 1998 Conference of the Society of Archivists. It is to be published in full at a later date.

REFERENCES

1. The novels were first bound by commission of their owner, John Forster in the 1870s. The second and third bindings took place whilst the manuscripts have been in the care of the Museum during the 1960s and 1990s.

2. Cancelled text and corrections can be found on the reverse of approximately 530 manuscript sheets. See Low,A., "The Conservation of Charles Dickens's Manuscripts" *The Paper Conservator,* Vol. 18 1994, pp.5-10.

3. "Large Post" folio sheets folded to make a "Large Post" quarto. See Low,A., *op .cit.*

4. H. Shenton "A Conservation Strategy for Books at the Victoria and Albert Museum", in The Institute of Paper Conservation, *Conference Papers Manchester 1992,* ed. Sheila Fairbrass (Leigh: 1992), pp. 133-140.

5. A. Low. *op.cit.*

NON-DESTRUCTIVE PIGMENT ANALYSIS USING RAMAN MICROSCOPY

Alan Derbyshire, Senior Paper Conservator

Robert Withnall, Senior Lecturer, University of Greenwich

Earlier this year it was possible to arrange for the loan of a Raman Microscope, free of charge, from Instruments(SA) Ltd. Dr. Robert Withnall was invited, from the University of Greenwich, to operate the instrument and – equally importantly – to interpret the results.

The main area of investigation (carried out over the course of two days) concerned the *in-situ* analysis of framed portrait miniatures. An additional half-day was spent analysing objects from other sections of the conservation department and explaining the theory of the instrument.

The use of Raman spectroscopy as a non-invasive, non-destructive method of pigment analysis is well known within the field of conservation[1],[2]. Its application to works of art on paper[3] is particularly useful where the paint layer is usually too thin to allow pigment sampling to be ethically or technically possible.

Before the relatively recent development of portable Raman spectrometers, access to this type of analysis was difficult to arrange because of the size of the instrument and the need to realign the optics after moving it. This meant that the object had to be taken to the instrument, normally housed in some university laboratory distant from the museum collection. Alternatively analysis relied on the invasive method of taking a sample which could then be analysed at the laboratory.

This paper will look at the use of the new range of portable Raman spectrometers, which can be easily transported to and within the studio. Due to developments such as charge coupled device (CCD) detectors, air cooled lasers and holographic filters, Raman spectrometers are physically smaller – hence portable – and they allow a more rapid collection of data. The instrument used in this study was a LabRam Microprobe[4].

The theory of Raman spectroscopy is described in the literature[5]. Professor C.V.Raman discovered the Raman effect in 1928. In the inelastic light scattering process, a single photon is scattered by a molecule and loses energy during the scattering event. The difference in energy between the original and scattered photons corresponds to a vibrational energy of the molecule of interest. The vibrational Raman spectrum acquired provides a 'fingerprint' of the molecule. Identification of the material can be made by reference to a library of spectra[6].

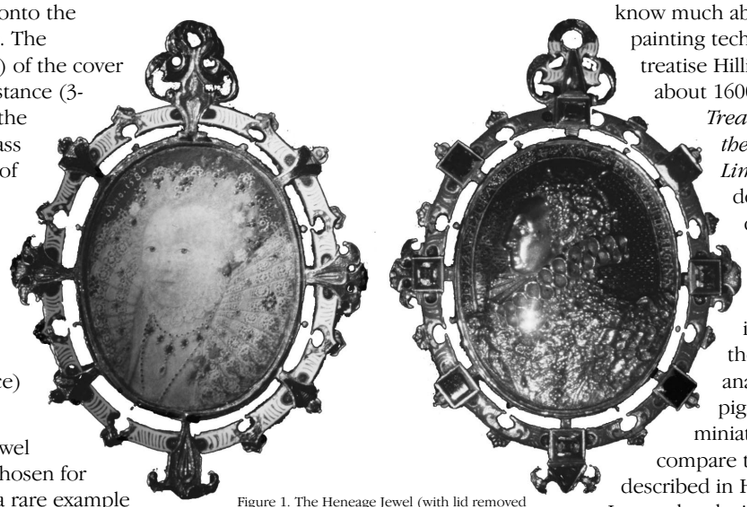
In practice a low powered laser light is directed on to the material to be analysed. The back-scattered radiation is collected by the objective lens of the microscope and the unwanted Rayleigh scattered light is rejected by a holographic super-notch filter. The data was processed via a PC with a software package that allows analysis of the obtained spectra. The pigment particles to be analysed could be located *in situ* by viewing the image on a video screen using a camera attached to the microscope. Areas with a diameter of less than 1μm can be focused on for analysis.

Analysis of portrait miniatures through the cover glass

One extremely useful function of Raman is its ability to be used through a microscope. This means that the incident beam can be focused on individual pigment particles. This is obviously a tremendous advantage when dealing with portrait miniatures where only tiny areas of colour may have been applied. Pigment mixtures can also be distinguished and analysed separately through the microscope. Another advantage, that has not been previously explored, is the possibility of focusing through the cover glass of the miniature. This means that pigment analysis can be carried out without having to take the miniature out of its locket/frame. This avoids the often difficult and time consuming process of opening the miniature's locket.

A suitable microscope objective had to be chosen to give a long enough working distance so that the microscope could be focused through the

cover glass and onto the pigment surface. The thickness (2mm) of the cover glass and the distance (3-4mm) between the convex cover glass and the surface of the miniature were the restricting factors. It was decided to use a x50 ULWD (Ultra Long Working Distance) objective.



Photography by Nick Frayling

Figure 1. The Heneage Jewel (with lid removed from miniature) circa 1600, V&A Museum No. M.81-1935. Actual length 2.75 inches.

The Heneage Jewel (Figure 1) was chosen for analysis, as it is a rare example of a portrait miniature, which is still in its original setting. The Heneage Jewel (also known as the Armada Jewel) is thought to have been given to Sir Thomas Heneage by Elizabeth I *circa* 1600. The miniature itself was painted by Nicholas Hilliard (1547–1619), in 1580, according to a gold lettered inscription on the blue background. However this inscription may well have been added at a later time. Hilliard who was originally trained as a goldsmith may have been involved in the making of the Jewel. We know much about miniature painting technique from the treatise Hilliard wrote in about 1600 entitled *A Treatise Concerning the Arte of Limning*[7]. In this document he also describes in detail the pigments that he used. It was interesting therefore to analyse the various pigments on the miniature and compare them to the ones described in Hilliard's treatise. It was also decided to analyse the cover glasses and the precious stones on the Jewel.

Results

In Figure 1 can be seen the cast gold profile of Elizabeth I, glazed by a domed, transparent cover and the gemstones set into the edge of the front of the locket. The Raman spectrum of the domed cover (Figure 2) shows a very strong band at 464cm^{-1} and weaker bands at 207, 265, 355, 392 and 402 cm $^{-1}$, which are assigned to alpha quartz i.e. rock crystal by comparison to its literature spectrum. It had long been supposed that this domed cover was rock crystal but this is the first time, as far as is known, that definite evidence has been obtained. In contrast the flat

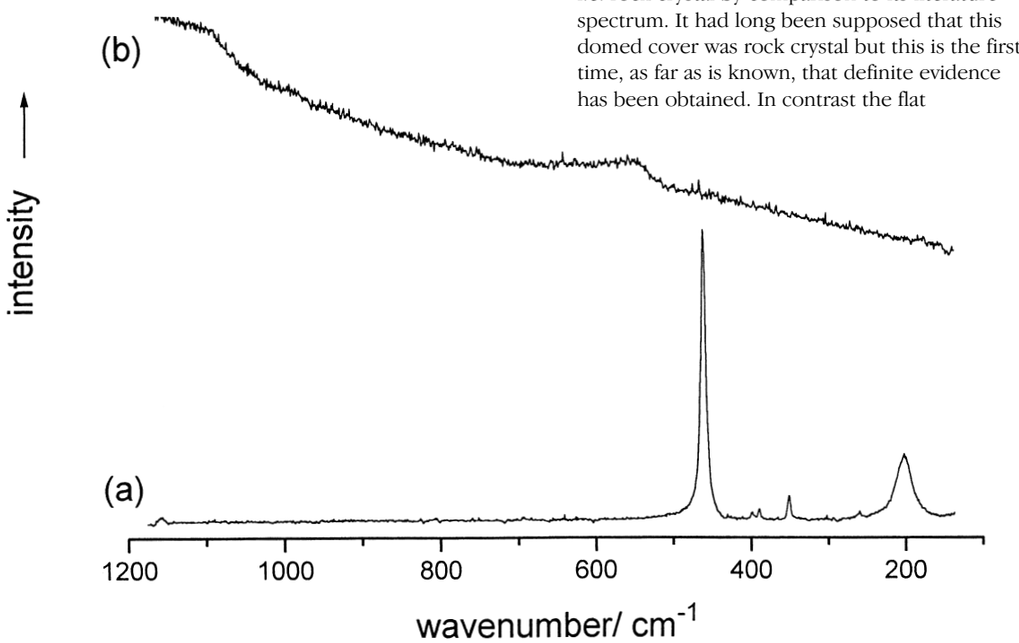
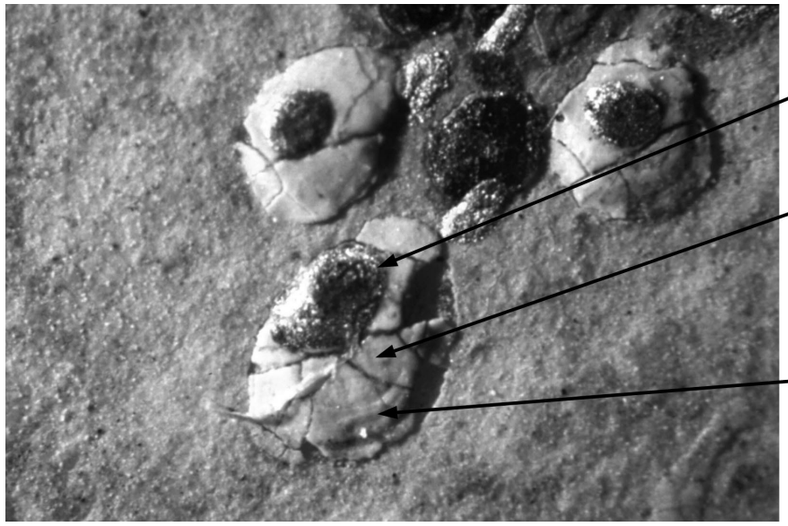


Figure 2. Raman spectra of (a) the domed cover on the front of the locket and (b) the flat cover on the reverse side. Both spectra have been obtained with an excitation wavelength of 632.8 nm and 0.8 mW of laser power at the sample.



Photography by Nick Frayling

Figure 3. Details of pearls from the miniature of Elizabeth I, Heneage Jewel, V&A Museum No. M.81-1935. Scale: 30 x magnification

transparent cover used to glaze the miniature exhibits weak broad bands centered on 546 and 1087 cm $^{-1}$; these are assigned to an amorphous glass.

It was possible to confirm that the red gemstones are rubies, as they give a characteristic fluorescence spectrum with sharp bands at 1379 and 1409 cm $^{-1}$ (when using a helium neon laser). The clear gemstones that alternate with the rubies were confirmed as diamonds, showing a very strong sharp band at 1331 cm $^{-1}$.

All pigment analyses on the miniature were performed by focusing the laser radiation through the cover glass and collecting the back scattered light. Identifications were made by comparison with published spectra.

Figure 3 shows a detail of three pearls from the miniature. In his treatise Hilliard describes in detail how to paint a pearl…

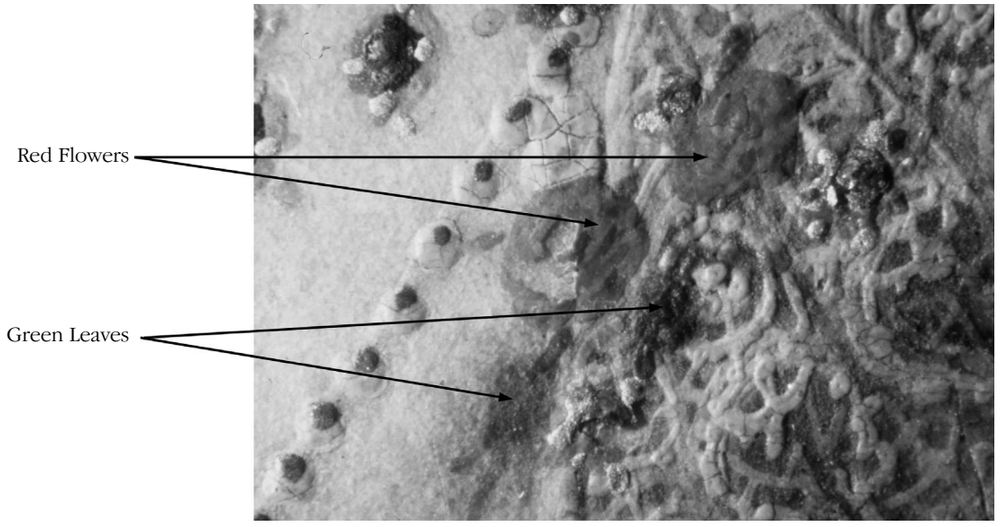
'…the pearls laid with white mixed with a little black, a little indigo, and a little massicot, but very little in comparison of the white, not the hundredth part. That being dry, give the light of your pearl with silver, somewhat more to the light side than the shadow side and as round and full as you can; then take a good white, delayed with massicot, and underneath at the shadow side give it a compassing stroke, which shows the reflection that a pearl hath…'[7]

Raman analysis of the pearl revealed that the main 'blob' of white contains lead white (basic lead carbonate) but no traces of indigo or massicot were found. The crescent shaped compassing stroke at the bottom right hand edge of the pearl was found to contain – somewhat unexpectedly– orpiment (arsenic (III) sulphide) with traces of pararealgar (arsenic (II) sulphide) and not massicot (orthorhombic lead(II) oxide) as recommended in the treatise. In the sixteenth century massicot may well have indicated lead tin yellow. This was more surprising as earlier in his treatise Hilliard warns that:-

'All ill-smelling colours, all ill-tasting, as orpiment….are naught for limning; use none of them if you may choose…'[7]

Figure 4 shows detail of the flowers and leaves, which were analysed. The flowers were found to consist of vermilion (mercury (II) sulphide) and the leaves consisted of malachite (a basic copper carbonate) and another green which, so far, it has not been possible to identify.

The background blue was analysed in a number of different places and found to contain azurite (a basic copper carbonate) and lazurite (the blue part of ultramarine) and in one case a mixture of the two with lead white. These inconsistent results are probably due to retouching to the considerably damaged background.



Photography by Nick Frayling

Figure 4. Detail of flowers and leaves from the miniature of Elizabeth I, Heneage Jewel, V&A Museum No. M.81-1935. Scale: 10 x magnification

Touches of purple decoration around the head were examined and found to consist of discrete blue particles, which gave strong Raman spectra corresponding to lazurite. However the purple itself gave no other distinct result.

Areas of the face were analysed. The white highlight in the eye was found to contain white lead and the very faint eyebrow was found to contain vermilion – as were the lips. The carnation layer, a thin opaque wash of flesh colour used by the limners to give a smooth surface on which to paint the facial features, was found to contain white lead. Other pigments that were identified include a mixture of yellow ochre and red lead (simulated orange gemstone) and azurite (blue dots around the painted jewel).

Various other pigments were also analysed. Full details will be published in the 'Journal of Raman Spectroscopy' in 1999.

Analysis of other objects
Objects from other studios were also examined using Raman microscopy. A number of these objects were three-dimensional and results could have been obtained more efficiently using a microprobe attachment. This was not available to us at the time but consists of a fibre-optically connected probe that can be readily used instead of the fixed microscope, making it possible to take readings from awkwardly shaped objects.

Man and Stag, W19-1945, panel painting circa, 1660-1670
This object currently being conserved by Annabelle Mills, in Paintings Conservation, for the British Galleries was examined in a number of different areas using Raman. This painting has been restored and has overpaint on some of the black lettering and in the sky area.

Raman microscopy indicated that the large capital letter was a mixture of vermilion and iron ochre. Another of the letters was found to contain carbon black.

The green foliage in the top left of the picture was found to be a mixture of lead chromate and smalt. The anachronistic use of lead chromate suggests that there is some retouching in this part of the painting.

Ceiling Panel, 2564F-1883, polychrome from South India, C18th.
This object is currently being conserved by Metaxia Ventikou in Sculpture Conservation. Most of this object is overpainted with only a few fragments of original pigment remaining. It was possible to identify both vermilion and orpiment using Raman microscopy.

Conclusion
The portable Raman Microscope proved to be an invaluable instrument for pigment analysis. It is a non-destructive, non-invasive method which is capable of analysing tiny areas of pigment (including individual pigment particles) that could not have been resolved using other methods. It also has the advantage of being able to identify the chemical compound rather than just the elemental composition as with XRF (X-ray fluorescence) or PIXE (external beam particle-induced X-ray emission).

The novel application tried during this project of analysing pigments through the cover glass of the miniature's locket proved very successful. Again this is a technique that could not be accomplished using other types of instrumental analysis.

Raman microscopy also proved to be a quick and efficient method of analysis for other materials such as gemstones, quartz and mica.

Pigment analysis on three-dimensional objects was also possible though would have been easier with the microprobe attachment.

Acknowledgements
I would like to thank my colleagues in paper conservation and from other sections. In particular I would like to thank Nick Frayling for advice and the photography.

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An investigation into the archival properties of colour photocopies and inkjet prints Summary of a project undertaken at Camberwell College of Art as part of a BA in Paper Conservation, Spring 1996

Anna Hillcoat-Imanishi
Graduate of RCA/VA Conservation Course 1998, MA in the Conservation of Indian and Southeast Asian Art on Paper

Colour photocopies and inkjet prints are part of our everyday life as economical and accessible ways of colour reproduction for the individual. Both of these technologies have been designed specifically for the small scale office reproduction market or the personal publication market. They also find wide distribution through their use by experimental artists, designers and text creators and by almost everybody as a cheaper alternative to photograph enlargement and poster production. The most important exhibition in this context was *Electroworks,* sponsored by the Xerox corporation.[1] David Hockney has also extensively worked with the medium.[2]

Although a large volume of colour photocopies and inkjet prints are produced every day, comparatively little is known about their production, their behaviour in normal environmental conditions and their reaction on exposure to light, humidity and pressure. Their ageing characteristics and their storage needs are also unknown. This is due to the relative novelty of the technologies: both processes have existed for less than thirty years. Because of their popularity and use by artists and designers, their characteristics and archival properties merit investigation. Works of art, documents or ephemera produced with one of these methods can pose serious problems for conservators and curators.

A series of experiments was therefore conducted to the test the reaction of colour photocopies and inkjet prints to everyday environmental conditions[3] and selected paper conservation treatments. Additionally, the project aimed to establish the characteristics of colour photocopies and inkjet prints with regard to their structure, distinguishing features and preservation requirements. The experiments were performed with an image reproduced using a dry tone colour photocopying machine by Canon®[4] and an inkjet printer connected to an Apple Macintosh® computer.[5]

From the results of the experiments one thing has emerged with clarity: colour photocopies and inkjet prints are fragile and complex objects.

Inkjet prints, due to the use of dyes in their fabrication, are extremely light-sensitive, with severe colour changes occurring during an exposure to a Microscal® light fastness tester 500 Watt bulb for 176 lux hours. Dry toner colour photocopies, on the other hand, are almost lightfast when exposed for 178 lux hours. Light exposure also severely discoloured the paper supports.

Thermal ageing at 80°C produced no visible damage to the image on the inkjet prints but the paper support had deteriorated. Colour photocopies however reacted very strongly to prolonged exposure to 80°C, with fusion of the toner resulting in a highly glossy surface. If the temperature had been higher the toner could have melted completely, resulting in bleeding of the image. Although the surface characteristics are changed, there are advantages to a melting of the toner: the plastic image layer is more flexible, the image/paper bond is stronger and the image is less prone to abrasion. In both cases the paper supports had yellowed badly and were less flexible than before thermal ageing. Although thermal ageing is an extremely artificial test of the archival characteristics of an object (a print will probably never experience prolonged temperatures of over 80°C) it can still offer useful guidelines. In this case it is obvious that the toner is not fully fused when the copy is produced, leaving the image layer vulnerable to toner flow under pressure or at increased temperatures. This explains the blocking (sticking together) of stacked colour photocopies. The toner also contains significant amounts of polyvinyl chloride and plasticisers which can soften other plastics in close contact with a colour photocopy.

The pH of inkjet prints was compared to that of blank inkjet paper and this indicated that the printing inks were slightly acidic. The pH of the dry toner colour photocopies could not be measured because the pigment layer was not water soluble.

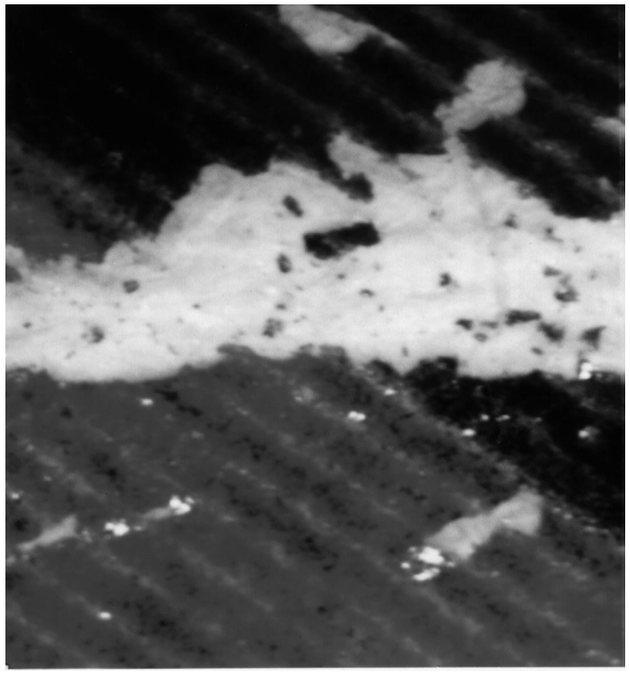

Figure 1. This crack in the image layer of a colour photocopy occurred after folding the paper just twice. Note the splintering of the brittle toner. (magnification x60 approx.)

The measurement of the paper/image bond with smudge-, peel- and fold resistance tests revealed that this bond was weak. The image layer of dry toner copies was very brittle, showing a glass-like splintering when folded (Figure 1). This was underlined by poor performance in peeling and smudging tests.[6] Inkjet prints also performed badly in the peel- and fold- resistance tests. This led to the discovery that the inks were not resting on or in the paper surface but in a crystalline coating on the paper which is designed to prevent bleeding and smudging of the inks on image production. It also aids in drying and building a crisper picture when the print is produced. This coating, however, can very easily be disturbed through abrasion or moisture due to very poor bonding with the paper sheet surface.

Relative humidity (RH) sensitivity tests revealed that the specific papers used for both techniques are very moisture-sensitive and cockle vigorously with rapid rises in RH. Cockling was first observed at an rise of 8%. This is probably due to the shortness of the fibres used, glazes, coatings and fillers in the paper. Furthermore, the water-impermeable image layer of the colour photocopy did not allow the paper to relax completely upon increases in RH and so stresses were built up within the object at the interfaces of plain and printed paper as well as underneath printed areas. These stresses could, if prolonged, lead to permanent distortion and even fibre failure in the affected areas. Inkjet prints also had difficulty with relaxation: during the test cockling occurred between the heavily and lightly printed areas of the sample. But the washing experiment indicated that complete relaxation of inkjet prints was possible on longer exposure to high humidity.

After completing the washing experiments the following conclusions were reached: washing an inkjet print or a colour photocopy is harmful due to the irreversible damage water causes to both object types. The manufactured surface characteristics are damaged or destroyed. Inkjet inks are extremely fugitive. On drying, distortions are created within the paper support of colour photocopies and cracks in the toner layer are likely on exposure to water. This is due to the difference in rate of expansion between the paper fibres and the impermeable toner layer. Friction drying[7] was revealed as the best drying method for both inkjet prints and colour photocopies, as all other methods tested resulted in too much ink loss, blurring, excessive cockling or shrinking.

Finally, some repair and retouching methods were tested on the samples. The application of water-based adhesives was problematic as cockling and poor adhesion were common. Due to the nature of the paper, even repairs using the same paper as

the supports showed up very strongly. Attempts at retouching using watercolours and colour pencils gave similarly poor results because the surface texture and the ink distribution pattern created by the printing processes could not be recreated (Figures 2 and 3).

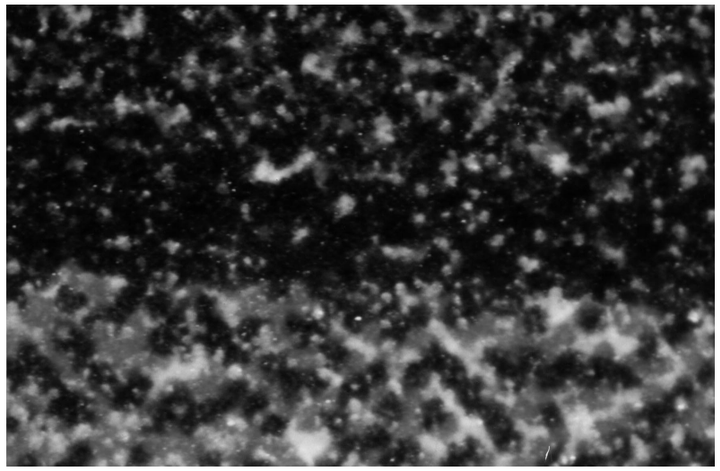

Figure 2. The dot matrix of an inkjet print. The ink is distributed in a random pattern to create the image with differently coloured dots lying next to each other. (magnification x60 approx.)

Figure 3. The striated surface of the image layer on a colour photocopy. Colours are created by layering differently coloured "glazes" of pigment bound in toner on top of each other. (magnification x60 approx.)

Acknowledgments:
I am indebted to Dr. Bob Thompson of London College of Printing and Distributive Trades for encouragement and invaluable information.

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5. Apple Macintosh ColourStyle Writer 2000
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7. A gentle drying and flattening technique.

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24th Annual Conference of Canadian Association for Conservation of Cultural Property in Whitehorse, Yukon, 27-29 May 1998

Alexandra Kosinova
Senior Sculpture Conservator, Sculpture Conservation

There are strange things done in the midnight sun
By the men who moil for gold;
The Arctic trails have their secret tales
that would make your blood run cold;
The Northern Lights have seen queer sights
But the queerest they ever did see
Was that night on the marge of Lake Lebarge
I cremated Sam McGee.
Robert Service: The Cremation of Sam McGee

I heard of the Gold Rush in the Canadian Yukon a long time before I discovered the manly poetry of Robert Service. But I guess the adventurer in me combined with the moiling conservator when Canadian Association for Conservation (CAC) announced that they would be holding their Annual 24th Conference and Workshop in the capital of Yukon, Whitehorse, as part of the celebrations of the centenary of the Gold Rush. Luckily at the time I was (and still am while writing this article) involved in the conservation of a highly photogenic object, the Boppard Altarpiece. I moiled at the computer and with the camera, and managed to put together a presentation which was well enough liked by the conference committee. With the financial assistance of the Conservation Department of the V&A I was finally able, at the end of May 1998, to land in that remote part of the world.

The conference took place over three days, at a very comfortable pace. The program covered conservation science, a wide range of case studies of museum objects, conservation of industrial and religious sites, reports on evaluations of old conservation treatments and modern materials, packing and transport, and papers on policies concerning treatments of the First Nations artifacts.

Margot Brunn of the Provincial Museum of Alberta gave an excellent paper on identification of placoid scales on shagreen, or shark skin, and gave examples of the use of shagreen in various decorative arts such as furniture and clothing, in particular boots. **Jean Tétreault** of the Canadian Conservation Institute (CCI) presented a very lively and informative paper on the choice of commercially available coatings used in various museum situations such as ventilated or air-tight showcases, open enclosures and floors made of different materials. A presentation bound to be appreciated by many practical conservators working with limited resources was given by **Nancy Odegaard** of Arizona State Museum, on spot testing of various materials such as metals, ceramics, plaster, glass, stone, pigments, bone, wood, fibres, gums, resins and accretions. **James Engelbert and Larry Pearson** presented an impressive paper on moving a 1915 Ukrainian church from a site in Alberta to the Canadian Museum of Civilization in Hull, Quebec, with emphasis on the multi disciplinary aspect of the project. **Scott Williams** spoke on the use of a portable FTIR spectrometer as an on-site and in-situ service provided by the CCI to identify the chemical composition of museum objects. A very practical presentation was given by **Marianne Webb,** Royal Ontario Museum, on using the nebulizer and a range of adhesives for consolidation of powdery paint. **Tom Stone** from the CCI reported on a survey of 112 mainly ethnographic objects treated at the CCI in the 70s and 80s, which are now housed in various museums across Canada. The survey was aiming to assess these documented treatments, pointing out materials that appear to have failed most often, e.g. cellulose ethers. Recommendations for a clearer way of documenting conservation treatments were also made. A fascinating project of preserving the Gulf of Georgia Cannery Site, run by Parks Canada, was described by **Carl Schlichting and Trish Poworoznik.** The site, built on pilings over the Fraser River in Steveston, British Columbia, presents various conservation challenges such as high RH, beetle infestation and pressure to run this site as a partly operational industry for the benefit of the visitors. A contrast to this vast project was the detailed paper given by **Kjerstin Emilia Mackie,** from the Royal British Columbia Museum, on conservation and analysis of a cloth cap. The research of the cultural history of this object included an examination of thousands of historic photographs of similar objects and developed into a cultural study. The presentation by **Jocelyn Hudon,** from the Provincial Museum of Alberta, on pigmentation of bird feathers, broadened the horizons of a traditional fine arts conservator like myself in more than one way: it made me think of pigments, materials that I deal with on a daily basis, in a whole new light and made me read about Edwin Land's retinex colour theory. Research into different textile covers and their ability to protect objects from UV light, depending on the type of fibre, yarn, and presence or absence of pigments and fillers, was undertaken and reported on by **Nancy Kerr** from the University of Alberta.

A most enjoyable after-sessions visit took the delegates on board The Klondike, a paddle steamer with an adjustable bottom, which used to serve the Yukon River between Whitehorse and Dawson City. It is now displayed on the river bank and open to visitors. We were taken around by the "dry dock crew" who maintain the steamer and learned about their effective preservation techniques in extreme climate conditions, such as -50%C frosts.

The Conference provided an excellent opportunity to meet conservators and other professionals in a relaxed atmosphere and in an exotic location. The receptions were opulent and the unplanned extras included a wildfire which covered the valley in a thick smoke for three days.

Conservation Scientists Show 'Em

Linda K Cooper, British Museum

Wednesday 30th September saw a lively meeting of the UK Conservation Scientist Group at the V&A. The topic was 'Showcases and Web-based services'.

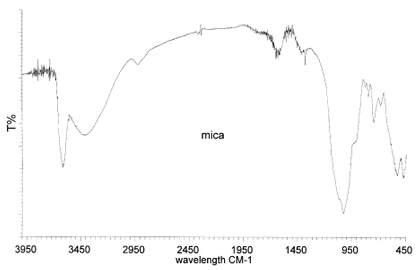
As the new Science Education Officer at the British Museum, I went along to find out just what a group of Conservation Scientists talks about. The title did fill me with a little trepidation. Was I really going to spend six hours hearing about showcases? However, once there I quickly realised that for anyone working in Museums, questions about showcases are serious. If we want to conserve the collections and allow public access, the choice of transparent display casing, as perhaps showcases should be called, and their internal fabric is of key importance. All in all it is a tricky job to find a compromise between cost, design criteria, available materials, timing and protection of the objects from humidity, pollution and the showcase materials. I now look at showcases with a different eye and sometimes find myself forgetting to look at the artefacts!

We discovered that there are a number of web initiatives that will lead to improved networking among scientists and will provide on line access to publications and for educational purposes, including virtual museums, the Royal Society of Chemistry site, and a large range of data-bases.

All this plus a tour of the labs and workshops of the V&A.

The Muscovite rebellion

Traditionally, it seems in some circles, it has been accepted that x-ray diffraction (XRD) is the instrument to use for identifying minerals. Recently, a 17th century casket was brought to Science and Information Section for analysis. A material covering the object was thought to be micaceous, though some doubts had been expressed. Not having immediate access to XRD it was decided that we should use our Fourier transform infrared spectrometer (FTIR) to shed further light on the nature of the material. FTIR was in fact ideal; not only would it have identified any polymer present (therefore saving embarrassment!), it was also suited to identifying mica. Mica has characteristic OH-stretching near 3622 cm^{-1} and a couplet at 825 cm^{-1} & 750 cm^{-1} due to Al-O-Si vibration. Polarising microscopy may also be useful for identification, though this would require more involved sample preparation and interpretation.



FTIR, like XRD, does require a sample from the object. This was obtained from a small fragment of material that had detached itself from the objects' surface. A standard potassium bromide (KBr) disc was prepared for FTIR analysis, though care was taken in grinding since, if the material was mica it could abrade some of the mortar and pestle into the sample. The resulting spectra produced a good match for mica, both against our reference samples and those described in the relevant literature.

XRD, at the British Museum and Natural History Museum, was used as a confirmatory technique. The geologists at the Natural History Museum confirmed our identification of a Muscovite-like mica. In the future, unless any confounding information is produced, we will use FTIR for further identification of possible micaceous materials.

InfraRed Users Group

The third international meeting of the InfraRed Users Group *(IRUG)* was held at the Winterthur Museum, Garden and Library, Winterthur, Delaware, USA, between 28 -30 May last year. Apart from the nearly twenty presentations, covering topics from new, rapid sampling techniques through to search algorithims used with spectral libraries, the meeting included a spectral interpretation workshop and finished with a half day business session.

The group has now elected a steering committee and a panel of editors to validate in excess of 1000 spectra in the IRUG's database of infrared spectra submitted by members. The database will be compiled for the next meeting (Maastricht, Holland November 1999) and will be made available to members.

For further information, please visit the IRUG web site, sponsored by the Philadelphia Museum of Art, at URL: www.irug.org.

RCA/V&A CONSERVATION COURSE ABSTRACTS

Helen Jones
Course Tutor, RCA/V&A Conservation Course

This Journal provides a welcome opportunity to present examples of work by the students on the RCA/V&A Conservation Course, both through the articles they contribute and this occasional series of abstracts. On looking back over previous issues, it seems that this preface often includes an apology for the long interval between abstracts, and the lack of space to present more. This problem is becoming more pressing as the Course expands and the body of work grows at a commensurate rate. Although the student abstracts are generally well received, they can only be included at the expense of other articles and their publication tends to be somewhat haphazard. The time has come to review this method of dissemination, especially now that the internet offers such exciting potential for sharing information. If readers have any constructive comments, they are welcome.

For the present, though, our intention is still to publish abstracts, in as complete and timely a way as space permits. In this issue you will find a selection of abstracts representing the three areas in which MA students submit essays for assessment: History of Art & Design, Science and Materials & Techniques. For two students, Elizabeth-Anne Haldane and Anna Hillcoat-Imanishi, all three essays are included, giving an idea of the progression of academic work and how it builds into a useful source of reference for the students. The subjects are often of interest to a wider audience and copies of student work may be consulted in the V&A Conservation Department Library by arrangement.

History of Art and Design Essay

Laura Jane Bennett
Applied Arts and Social History Object Conservation
The Visual Impact of the Festival of Britain 1951
April 1997

6870 words

The Festival of Britain in 1951 set out to re-establish an art and design identity for Britain after the Second World War. It offered a means to re-assert national pride and celebrate cultural identity after the constraints of war and was a chance for a new Labour government to lay out blueprints for the revitalization of the British economy and for future success.

The Festival of Britain illustrates a turning point in the history of art and design. It played a vital role in the development of the industrial designer and the creation of well designed products available to all. The consequences of war gave the Festival a dramatic backdrop against which to devise a plan for a new Britain. But to what extent was the visual impact of the Festival new and optimistic? Did it succeed in capturing the aspirations of the people of post-war Britain?

This essay examines the influence of war and the society it created on art and design in the 1950s, as illustrated by the Festival of Britain. It evaluates the motives of artists and designers in an attempt to explore the development of art and design within contemporary popular culture.

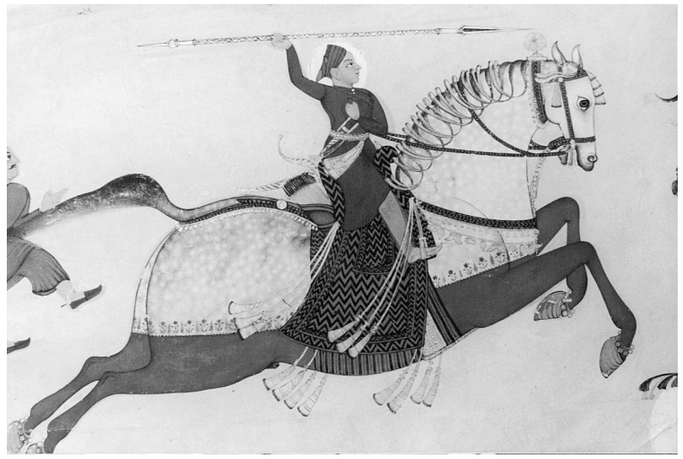
Elizabeth-Anne Haldane
Textile Conservation
Stylistic Developments in the Costumes of the Ballets Russes – from Bakst to Picasso
January 1997

6500 words

The Ballets Russes of Sergei Diaghilev first performed in Paris in 1909 to great artistic acclaim. Their productions were to influence not only the development of ballet in the West – revolutionizing the approach to music, choreography and stage design – but would also have significant effects on fashion and interior design, heralding the age of Art Deco.

This essay looks at stylistic developments in the costumes of the Ballets Russes between 1909 and 1917. Diaghilev's company produced a wide variety of ballets and involved many of the leading artists from the early 20th century. This essay focuses on three productions, each of which proved to be stylistically important: *Scheherazade* from 1910 designed by Leon Bakst, *Le Sacre du Printemps* from 1913 designed by Nikolai Roerich, and *Parade* from 1917 designed by Pablo Picasso.

The importance of the sets and costumes to the rest of the production is explored, and the work of the different artists for the three ballets compared and contrasted with a view to explaining the diversity of styles in the costume designs. Finally the reasons for the company's changes in stylistic direction are examined.



Anna Hillcoat-Imanishi
Paper Conservation
Nimbus. The Halo in the Art of the Indian Subcontinent with an Emphasis on Mughal Miniatures
January 1997

5500 words

The paper presents nimbuses in their various forms as they occur in the arts of the Indo-European cultural area. The essay aims to elaborate on the use of nimbuses in Mughal miniature paintings and investigate the origins of the nimbus in the repertoire of the Mughal court painter. The main focus of the investigation lies in the question of whether the Mughal nimbus is related to Christian nimbuses or can be traced back to a tradition of nimbus painting within Islamic art.

After exploring the meaning of the nimbus and presenting the main forms of occurrence, examples of Christian nimbuses are presented and discussed. Similarly, nimbuses in the arts of the Indian subcontinent are illustrated. Finally, Persian art is investigated. In the second part of the paper Mughal nimbuses are presented and discussed in detail.

A conclusion presents the outcome of the investigations, and attempts the interpretation of the Mughal nimbus.

Laura Jane Davies (nee Bennett)
Applied Arts and Social History
Objects Conservation
Horn of Plenty. The History of Horn Working and its Occurrence in Social History Collections

6720 words

Horn has been utilised throughout history because it was a readily available waste product from butchery. As a poor man's material, it represents a valuable tradition of folk craft and source for social history. Horn is thermoplastic and by the nineteenth century, production processes involving pressing and moulding were highly developed. This knowledge of horn-working contributed to the development of synthetic plastics.

The essay begins with a description of the physical properties of horn and the way these are related to the structure and chemical composition of the material. This section also places horn in its context as a skeletal material, by comparing it with horn, ivory, bone and antler. The identification of these materials is very important for historical evidence and conservation implications.

Two distinct types of craft represent horn-working, and these are described in the second part of this essay: those which utilize the natural shape and qualities of horn, and those which manipulated these characteristics. The former are associated with domestic craft while the latter required specialist knowledge and equipment. The majority of the objects examined for this essay are from the collection of the Worshipful Company of Horners kept at the Museum of London.

Science Essays

Elizabeth-Anne Haldane
Textile Conservation
Cellulose and its Derivatives
April 1997

6700 words

This essay begins with a general discussion about the natural polymer cellulose, looking at its molecular composition and bonding in order to understand how it behaves as part of a larger structure.

Although wood, paper and cotton are mainly composed of cellulose, they have very different mechanical properties. To understand the reasons for these differences, the natural and man-made structures which are formed by cellulose in wood, paper and cotton are investigated and compared.

The second part of the essay deals with cellulose which has been chemically modified. Following a brief historical outline of the development of cellulose derivatives, four are examined in detail. These examples are particularly relevant to textile conservation. Cellulose nitrate, in the form of Celluloid, was the first 'plastic' and can be found in textile and dress collections as trimmings or accessories. Cellulose acetate is widely used as a textile fibre as is viscose rayon, which is actually a regenerated cellulose. The last example is sodium carboxymethylcellulose, which is used during the washing of textiles in order to prevent the redeposition of dirt. The chemistry of the manufacture of these materials is described, and their properties and applications are discussed and compared.

Anna Hillcoat-Imanishi
Paper Conservation
Substantia Aut Accidens? An Investigation into Historical Theories on Light and an Explanation of the Production of Colour by Organic Molecules Employing the Orbital Model Based on Quantum Mechanics
April 1997

7800 words

The paper analyses the interaction of matter with electromagnetic radiation, in particular how colours are produced in organic molecules. A concise overview of the evolution of various theories of light, from the beginnings in classical philosophy to the quantum theories of the twentieth century, finishing with the concept of wave-particle duality is given. The model used to describe colours relies on an understanding of certain theories on the nature of light in general, which are discussed in part one of the paper. Part two gives a brief outline of the structure of atoms and bonding mechanisms on organic molecules as a precursor to the model of colour explanation. The nature of colour and how colours are produced within the molecules are discussed in part three. The paper concludes with a summary of the findings.

Materials and Techniques Essays

Roger Griffith
Furniture Conservation
Materials and Techniques of Tubular Steel Furniture
October 1996

6975 words

This essay outlines the materials and techniques of tubular steel, and also briefly outlines the history and origins of tubular steel furniture. The paper primarily highlights furniture of the 1920s and 1930s, when tubular steel was the material of the future. It was in these years that tubular steel was of the greatest significance as an industrial material. No attempt has been made in this essay to cover other types of metals used in the production of tubular furniture. The paper concentrates on the basic processes of steel tube production and applied surface treatments. Research for this paper revealed the lack of information from the British Furniture Companies of the 1920s and 1930s. For both Pel and Cox & Company, there is virtually no production documentation; Pel lost everything in a fire in the 1950s and Cox, after its take-over by Pel, lost its archival material.

Anna Hillcoat-Imanishi
Paper Conservation
Minium, Gold and Cow's Urine. The Materials and Techniques of Mughal Miniatures
December 1997

10800 words

This study provides a survey of the materials and techniques used to paint Mughal miniatures as described in the literature. Observations made while examining a page of the *Akbarnama* manuscript supplement the information from documentary sources. Pigments are illustrated by samples of the actual pigment painted out on suitable paper using a traditional binder. The techniques of painting are illustrated by photomicrographs taken of the *Akbarnama* page. The results of the survey, together with observations based on the practical experiences, are discussed in the conclusion. Implications for future research and conservation practice are considered.

Elizabeth-Anne Haldane
Textile Conservation
Elastic Fantastic to "Lycra Sensations"
October 1997

7100 words

Elastomeric fibres include natural rubber, synthetic rubber and elastanes. In this essay the properties of these different materials are described, and the methods by which they are manufactured into textile fibres are discussed. In addition, the techniques for incorporating these fibres into fabric structures are explored.

The essay is divided into two sections. The first section is about natural rubber, which was first used in conjunction with textiles early in the nineteenth century. Early inventions for elasticated fabrics, the vulcanisation of rubber, and the introduction of the first continuous rubber filament 'Lastex' are discussed.

The second section touches on the variety of synthetic rubbers which were created when there was a shortage of natural rubber during the World War II, then looks at "Lycra" which was the first of the polyurethane elastane fibres (1959). The methods of manufacture and differences between various elastanes are described, in particular the latest elastane fibres being developed in Japan. Finally, the ways in which these fibres can be incorporated into fabric structures, and the different effects which can be achieved by varying the direction and/or amount of elastane used, are examined.

Shayne Lang
Furniture Conservation
English Japanning: 1660-1700
December 1997

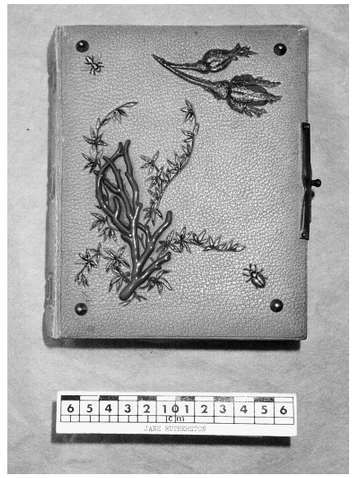
9000 words

This paper examines two early technical treatises in order to consider the materials and techniques used to create japanned surfaces on early English furniture. Relevant sections of John Evelyn's Silva (1664) and Stalker and Parker's *A Treatise of Japanning and Varnishing* (1688) are systematically evaluated in order more fully to understand English japanned surfaces of the late seventeenth and early eighteenth centuries. These were created using complex, multi-layered spirit varnish surfaces which imitated the translucence of oriental lacquer. It provides some historical context before discussing the preparation of japan grounds and the decoration applied to them.

Jane Rutherston
Book Conservation
Victorian Album Structures
October 1996

6942 words

This essay takes a look at the development of album structures during the Victorian period, a time of



innovation and expanding commercialism. Album evolution was influenced by advances in technology and the introduction of new materials, combined with the quest for new designs in which to mount the increasingly popular photographs, scraps and other ephemeral material.

Spurred by the need to meet public demand, it was necessary to develop techniques that could be mass produced using inexpensive materials.

Sophia Strang Steel
Metals Conservation
The Surface Embellishment of Metals (With an Emphasis on Colour Contrasts)
October 1996

7120 words

The surface enrichment of metals could be interpreted as increasing the precious metal content at the surface of a metal object or as an increase in decorative value. This paper does not distinguish between the two issues but does concentrate on the techniques for creating colour contrasts. Evidence of the contrasting of colours in metals goes back to the second millennium BC where precious metals were inlayed into patinated alloys. The methods of creating coloured surfaces on metals are varied and the potential applications in design almost limitless. This investigation of surface embellishment is not so much a survey of the techniques of fabrication, but an overview of coloured surface structures which might be useful to the conservator. The main areas covered are the application and depletion of surface layers, the lamination of metals and the creation of stable surface films (chiefly in relation to the patination of alloys). Alloys are used extensively throughout the world for many functional and decorative purposes, so the essay gives a brief description of the nature of alloys and the relationship of their composition to properties.

V&A New Staff

Zenzie Tinker
Textiles Conservator, Textiles Conservation

After a degree in the History of Design specialising in textiles and dress, I began an apprenticeship with Ksynia Marko (now Manager of the Textile Conservation Studio for the National Trust) in early 1986. This was a wonderfully varied, practical training in the conservation of general textiles and tapestries and combined well with my Museums Association Certificate in Textile Conservation. During this time I spent a three-month internship here at the V&A, and a month with the mobile conservation laboratory for the Regional Galleries of NSW, Australia.

I moved on to join the Conservation Department at the Museum of London in 1991. There I developed a specialism in costume and gained wide experience of the varied aspects of museum conservation. My later years at the Museum of London were dominated by extensive work preparing the costumes and accessories for *In Royal Fashion: the Clothes of Princess Charlotte of Wales and Queen Victoria.* As conservation liaison officer, I was also able to get involved with the broader remit of conservation for the whole exhibition.

An interest in adhesives led to close involvement in setting up, with Lynda Hillyer, the UKIC Textile Section Adhesives Group, and helping to run a series of workshops, forums and surveys investigating the current use and application of adhesives in textile conservation.

Although sad to leave the Museum of London, a permanent post at the V&A was too good an opportunity to miss! I was thrilled to be given the chance to work within a large team of textile conservators again – many of whom I have worked closely with in the past. I hope that the experience I bring will complement the Section and the Department as a whole.

Annabel Swindells
Secretary to the Head of Conservation.

My early years as a secretary were spent in various colleges of London University interspersed with odd years abroad – Vienna for pure pleasure, the Department of Epidemiology at McGill University in Montreal, VSO in a bush hospital in central Tanzania. I then settled in the Geography Department at UCL for 13 years until I decided it was time to find out what the world outside an academic environment had to offer. A brief spell in a commercial company owned by the Ministry of Defence taught me that work interest was far more important than a high salary and I moved on to spend two years temping, ending up at the Tower of London.

After six months with the Resident Governor in the Queen's House, I felt it would be safer to return to a permanent job and spent some years working for the publisher of the Art and Illustrated List in one of the major publishing houses.

I had often thought it would be interesting to work in a museum, having been in the shadow of the British Museum in Bloomsbury for so long, and was delighted to come to the V&A three years ago to the Collections Department, and then to Major Projects. Moving to Conservation gives me a welcomed chance to see another aspect of what goes on behind the galleries of the Museum.

Conservation Department Staff Chart

Head of Conservation
Jonathan Ashley-Smith

Secretary
Annabel Swindells

RCA/V&A Course Director
Alan Cummings

Head of Science and Information
Graham Martin

RCA/V&A Course
Helen Jones
Alison Richmond

Conservation Library
Alice Rymill

Science
Boris Pretzel
David Ford
Paula Mills

Administration
Abigail Wright

Furniture
Albert Neher
Tim Miller
Christine Powell
Tim Hayes
Nigel Bamforth

Ceramics & Glass
Victoria Oakley
Fi Jordan
Juanita Navarro

Metals
Diana Heath
Simon Metcalf
Joanna Whalley
Sophia Wills
Ingrid Barré

Sculpture
Richard Cook
Charlotte Hubbard
Alexandra Kosinova

Books
Jane Rutherston
Bridget Mitchell
Pascale Regnault

Textiles
Lynda Hillyer
Marion Kite
Val Blyth
Anne Amos
Derek Balfour
Albertina Cogram
Audrey Hill
Frances Hartog
Zenzie Tinker

Paper
Pauline Webber
Alan Derbyshire
Merryl Huxtable
Elizabeth Martin
Michael Wheeler
Victoria Button

Mounters
Danny Norman
Clair Battisson
Simon Fleury
Chris Gingell

Paintings
Nicola Costaras
Katharine Donaldson

Students

*Furniture**
Rowan Carter *(MA)*
Victoria Doran *(MPhil)*
Ricard Sundström *(MA)*

*Metals**
Annie Hall *(MA)*
Lyndsey Morgan *(MPhil)*
Kirstie Reid *(MPhil)*

*Paper**
Sandra Grantham *(PhD)*
Magdalena Kozera *(PhD)*
Cecilia Rönnerstam *(MA)*
Shiho Sasaki *(MA)*

*Textiles**
Elizabeth-Anne Haldane *(MA)*
Heather Porter *(MA)*

Computer Visualisation
Nicholas Frayling *(PhD)*
Angela Geary *(MPhil)*
Thanasis Velios *(MPhil)*

Risk Assessment
William Lindsay *(PhD)*

*Sculpture**
Metaxia Ventikou *(MA)*
Deborah Morey *(MA)*
(With Holden Conservation Services)

Social History Objects
Laura Davies
(With Museum of London)

20th Century Materials
Francesca Cappitelli *(MPhil)*
Fotini Koussiaki *(MPhil)*
(with Tate Gallery)
Silvia Valussi *(MPhil)*

Science
Paul Cadman *(MPhil)*
Pedro Gaspar *(MPhil)*

Ethnographic Materials
Victoria Hobbs *(MA)*
(With Horniman Museum)

*denotes discipline, not necessarily the V&A Conservation Department Section

Internships
Femke Hameetman

Paintings
Eowyn Kerr

Furniture
Henriette Stuchtey
Genoveva Romero

Paper
Jim Poncelet
Sigrun Thiel

Ceramics
Laurette Lamen Trip
Katrina Pantelli

Sculpture
Adeline Wartner

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