

Resumo

Nicholas Hilliard, que se tornou famoso no séc. XVI pelos seus retratos em miniatura, perseguia o ideal de uma representação da natureza tão próxima do real quanto possível. «That it seemeth...the work of god and not of man». Para atingir esse objectivo, utilizou diversas técnicas, em parte baseadas na tradição da iluminura medieval, mas também na sua formação como ourives. Utilizou um número invulgarmente elevado de pigmentos pretos, alguns obtidos a partir das sementes de frutos carbonizadas, para reproduzir o efeito do veludo preto e das sedas. Classificou também os pigmentos em diversos tipos (categorias? graus). Por exemplo, um tipo médio de branco de chumbo seria o ideal para imitar o aspecto «de pó» de uma maquilhagem, enquanto que um outro tipo, constituído por partículas muito finas, seria o ideal para o impasto brilhante necessário para realçar um laço. Esta última tinta aplicada muito espessa, resultante da mistura do branco de chumbo com muita goma, apresenta um craquelê característico e falta de adesão. Alguns destes danos podem ter sido visíveis ainda no tempo de vida do artista, sem que no entanto o tenham levado a alterar a sua técnica.

Um outro exemplo, é o da aplicação de prata em pó (para as armaduras e os realces nas pérolas), que também apresenta problemas de conservação uma vez que a prata cedo começou a escurecer (embaciar?). Resinas aplicadas muito espessas em fundos prateados, para imitar o efeito brilhante das pedras preciosas ou esmaltes, foram muitas vezes esmagadas ainda quando frescas e apresentam-se lascadas ou quebradiças quando secas. Os autores reconstruíram muitos destes métodos e efeitos especiais no âmbito de um projecto levado a cabo no Victoria and Albert Museum (Londres). A produção das reconstruções baseou-se tanto nos resultados obtidos por análises científicas de miniaturas e observação do efeito visual como na pesquisa de fontes escritas contemporâneas ou anteriores. Esta abordagem revelou-se muito frutuosa, pois permitiu tanto reproduzir os magníficos efeitos visuais que terão existido nas miniaturas originais como identificar danos típicos associados ao uso de certos materiais e técnicas. ●

palavras-chave

RETRATOS EM MINIATURA
LIMNING
HILLIARD
TÉCNICA PICTÓRICA
ALQUIMIA

Abstract

Nicholas Hilliard, a 16th century English painter of portrait miniatures or limnings, was driven by the idea of depicting nature as realistically as possible. «That it seemeth... the work of god and not of man». To achieve his aim he used several special methods and techniques, which partly derived from medieval book illumination traditions but also from his own background as a goldsmith. He applied an unusual number of black pigments, some made from charred fruit-stones, to match the appearance of black velvet and silk cloth. He also sorted pigments into various grades. For instance a medium grade of lead white was ideal to imitate the powdery appearance of makeup and another grade, with very fine particles, for the glossy impasto paint he used to depict lace. The thick application of lead mixed with a lot of gum to achieve this effect led to typical cracks and flaking. Some damage might have already occurred during his life-time, nevertheless he continued to use the techniques, which caused them. Another example is the application of powdered silver (for armour and the highlights on pearls), which turned out to be problematic as the silver soon started to tarnish. Thickly applied resin on silver grounds to create the glossy impression of precious stones and enamel often became squashed when fresh, and chipped or flaked of when dry. The authors practically reconstructed many of these methods and effects used on limnings in the context of a research project in the Victoria and Albert Museum in London. The practical work was based on visual examination, instrumental analysis of original portrait miniatures and extensive analysis of earlier and contemporary written sources. The practical approach proved to be highly informative as it not only helped to reconstruct the amazing effects of the original appearance but also to identify typical damage inherent in the use of specific materials and techniques. ●

key-words

PORTRAIT MINIATURE
LIMNING
HILLIARD
PAINTING TECHNIQUE
ALCHEMY

THAT IT SEEMETH TO BE THE THING ITSELF

THE OBSESSION OF 16TH CENTURY MINIATURE PAINTERS TO IMITATE THE BEAUTY OF NATURE

TIMEA TALLIAN

Ethnographical Museum, Vienna and the
V&A Museum, London (England)

ALAN DERBYSHIRE

Victoria and Albert Museum, London
(England)

Introduction and sources

The information presented in this article is mainly based on source material related to the English limner Nicholas Hilliard (1547-1619) and his followers and students. Instrumental Analysis of original limnings has been performed in the conservation department of the Victoria and Albert Museum since the 80s (in particular by the late Jim Murrell and more recently by Alan Derbyshire and various students). Advances in non-destructive techniques such as digital photography, computer image manipulation, Raman Spectroscopy and XRF in the last 10 years have allowed many new opportunities to update and amend the information derived from earlier research.

What makes the research on limnings so unique is an abundance of written source material. The three main sources used for this research have been the manuscripts associated with Nicholas Hilliard, Edward Norgate and John Hoskins. (see table 1). Unlike the many anonymous illuminators from previous centuries, Hilliard and his circle left us with a detailed written account of their ideas, ideals and working methods. Their knowledge originates directly from those illuminators of the Ghent Bruges School, who were called to live and work in England by Henry VIII¹.

Another indispensable source of knowledge and understanding was the practical reconstruction of materials and techniques. This process was aiming to understand the reasons why certain materials have been used but from a 16th century viewpoint. Reconstruction was not always a success and in most cases a humbling experience as we were not able to achieve the same quality and effects as observed on the originals. However trial and error provided many new insights and a lot more questions.

1. Lucas Horenbout, often called Hornebolte in England, (Ghent c. 1490 to 1495 – London 1544) was a Flemish artist who moved to England in the mid-1520s together with his sister Susanna and his father Gerard and worked there as «King's Painter» and court miniaturist to King Henry VIII from 1525 until his death. His father Gerard Horenbout was an important Flemish manuscript illuminator (Reynolds 2006: 45).

It also suggested that some typical deterioration phenomena must have occurred quite rapidly after the making of the objects. Nevertheless limners continued to use them for some time until the 1640s. This paper aims to explore the reasons why limners, who according to their writings were aware of the risks, still continued to use certain methods and materials.

TABLE 1

Hilliard MS	Norgate MS	Hoskins MS (known as Gyles' book)
Edinburgh, University Library, LaingIII174, f.1-14	Oxford, Bodleian Library, Tan.326	<ul style="list-style-type: none"> • Original – London, British Library, Harley 6376. • Copy – (Hoskins MS copy), NAL, MS copy of Harl. 6376, R.C.A. 20-995-1906.
ed. Thornton and Cain 1992	ed. Muller and Murrell 1994	Extracts published in Muller and Murrell 1997:237-252 and in Murrell 1983:76-79, 80-84, 92-93

The Arte of Limning – That it Seemeth to be the Thing Itself...

Illumination did not stop with the invention of printed books. On the contrary, in the 16th century it was not only used for luxury books and important documents but also for portraits after life and illustrations in scholarly publications (for instance of a geographic, ethnographic, zoological or botanic nature). Hilliard and Norgate amongst others stated that it should ideally be practised 'by gentlemen only'. First of all because it required a gentle nature and was clean to use (did not spoil expensive clothing like oil!). It is recommended for the young gentry as an innocent pastime and useful skill for a future career at court, in war and scientific studies. Further the gentry, not having to make a living (unlike the notoriously financially struggling common artist) could spend the full time required to produce excellent works of art. Also they could easily afford the best quality materials. Limning was (and is, if one aims at accurate reconstruction) indeed expensive. The pricy materials include, first of all, paint made from the metals gold and silver; pigments derived from semi-precious stones; and many exotic materials (like the binder gum Arabic or Indian lake). But also cheaper materials like earth colours and lead pigments had to be of high quality for the fine painting. Each pigment needed to be washed, ground and prepared in a particular manner. Beside all this the best quality fine parchment was required. It is often claimed to be made from the smooth skin of a (yet hairless) animal embryo (called 'abortive'). It was so thin and fine, that it had to be mounted on a playing card (limnings are usually quite small, about 7x5cm average). Reconstruction also suggested that the skins of small mammals, in particular white rabbits, might have been a possible source or at least an alternative. It can be said that the search for a parchment support of sufficient quality has been difficult and the biggest obstacle for an accurate modern reconstruction. The 16th century gentry conveniently could

2. It was Hilliard who first observed that the effects of sulphurous pollution on pigments and he states that the working place should be free from the «*Sulphurous aire of Sea Cole*» (Thornton and Cain p.75). Indeed it seems to be basically atmospheric hydrogen sulfide which causes the discoloration by converting lead white (basic(II) lead carbonate) into the black compound lead(II) sulfide.

purchase materials ready prepared from professional limners, as for instance Alexander Brown (Browne 1679: 39).

There is also an arcane aspect of limning. In many ways the usage of 16th century English limning is comparable to the use of photography. However it does not only aim for the naturalistic depiction after life but aspires to transmute pigment and binder into something different, for instance into a real gemstone, an enamelled jewel, a plant or even a piece of textile. Hilliard also puts a lot of emphasis on «super» realistic depiction, suggesting to use the material to depict itself: «... *worketh the metals gold and silver with themselves*» (Thornton and Cain: 63) He even set a real diamond into one of his miniatures (coronation portrait of queen Elizabeth, 1559, Wellbeck collection). Portrait miniatures of the aging Queen Elizabeth I, in a way, also illustrate this point. They certainly did not intend to realistically depict the physical appearance of a nearly 60 year old queen. More than her wrinkles, it was essential for Hilliard to depict the essence of Her Majesty, which was the Virgin Queen, 'Gloriana', the English equivalent to Virgin Mary. Miniature portraits of her and even medals were treated with the highest respect, similar to icons. Any wilful damage to her picture was in fact considered to be high treason. For instance Thomas Harrison was accused of endangering Queen Elizabeth's I life by placing a medal with the picture of her Majesty next to mercury sublimate, which was poisonous and had already corroded the metal. Interestingly Harrison defended himself by claiming that the damage was not intentional and that Nicholas Hilliard (!) had made the metal image and that it had dissolved again in the wooden box into quicksilver (mercury) (Auerbach pp.32-33). There is no evidence that Hilliard was an alchemist but he certainly had a chemical understanding of materials due to his experience as goldsmith. Hilliard clearly was very aware of reactive chemical processes and is probably one of the first authors describing the deleterious effect of sulphuric gases on pigments² and classifies in his treatise some colours as «*not fit to be used in limning*». Most of the pigments he mentions are prone to fading in light or have the tendency to discolour when being mixed with other pigments (as vermilion – HgS or pigment – As₂S₃), others might change to a dull colour (the copper pigments: Verdigris, Verditer)¹. Nevertheless it has been shown by analysis that he, against better knowledge, used some of those pigments, as for instance vermilion and orpiment. Was he betrayed by his colour merchant; simply a hypocrite; or did he have good reasons not to stick to his own rules? Previous and recent Raman analysis of Hilliard's palette allowed 13 pigments to be unambiguously identified: lead white, lead red, massicot, vermilion, azurite, natural ultramarine, indigo, malachite, orpiment, pararealgar, yellow ochre, red ochre, and carbon black (Derbyshire 1999, Tallian 2007).

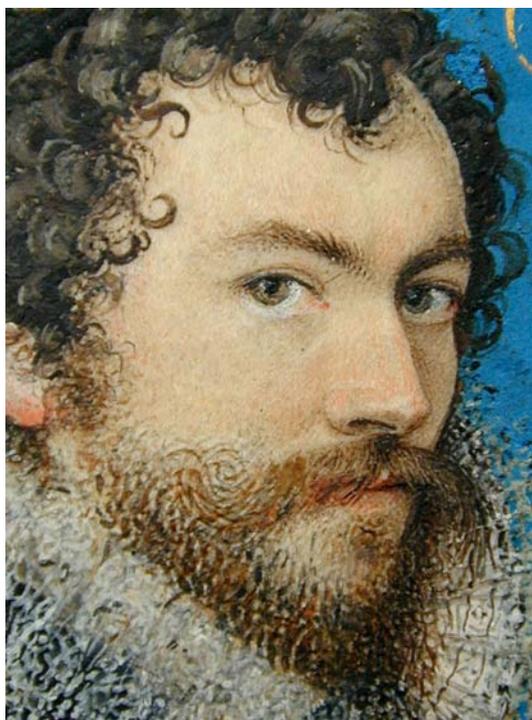


FIG.1 DETAIL FROM NICHOLAS HILLIARD, SELF-PORTRAIT 1577, WATERCOLOUR ON PARCHMENT, DIA. 41MM (V&A, P.155-1910)

Special effects

Limnings were made to be looked upon at close distance, intimately held in the hand and to be worn in jewels. This was ideal for fine details and the use of techniques

taking advantage of raking light and movement. Special effects became Hilliard's trademark e.g. his crisp golden calligraphy, burnished silver highlights on pearls, little sparkling life-like rubies, the bright red Indian lake crimson curtain, glistening and brilliantly blue ultramarine backgrounds, the detailed black textiles and the raised lace of glossy lead white impasto. These effects fascinated not only contemporaries but have the power to enchant us till the present day. Unfortunately most of the mentioned techniques, even though Hilliard tried his best, occasionally caused problems due to the inherent properties of the used materials. Silver tends to tarnish, Venetian turpentine resin dries very slowly and is easily squashed. Indian lake easily fades and requires – for a good colour – a lot of gum and sugar (a combination, which attracts dust and is prone to dry out and crack); ultramarine is of a gritty sandy consistence and sometimes (when the pigment binder ratio is not right) rubs or flakes off; ivory black tends to flake and so does the thick and heavily gummed layers of lead white. Hilliard must have been clearly in a dilemma.

But interestingly he did not give up his technique. Sparkling silver looked too good in combination with gold. Indian lake was used also in reality to colour expensive bright red luxury textiles (and was one of the most costly pigments at the time). Ultramarine was a precious gemstone, making the portrait look even more like a jewel; it was adding to its material value and also provided a great contrast for gold inscriptions. Charred Ivory, even though it has its tendency to be a difficult pigment, is creating probably the most appealing and again pricy 'blackest black' available, ideal for strong shadows or ornaments in dark costumes or the dark centre of the eye. And vermilion, condemned by Hilliard as an 'unfit' colour, was still used by him (proved by analysis) in the face and lips as it produces a radiant red and for the very same reason this pigment was applied by the ladies as rouge and lipstick. And the raised white laces, accurately dribbled in fine lines onto the parchment like icing sugar, casting their own shadows, just looked strikingly real. It was all too tempting, exquisite and worth the risk.

Precaution and Deterioration

There are various suggestions in the treatises to prevent certain deterioration phenomena (to protect the silver, how to prepare and to use black pigments to ensure quality and prevent cracking, how to refine ultramarine and most important how to refine lead white and to prevent it from tarnishing).

All these methods worked to a large extent, which is evident in Hilliard's best miniatures and their excellent condition. In strong contrast to our modern reconstructions: those almost immediately showed all sorts of problems. However to a certain percentage, even Hilliard had to lose his battle against 'stubborn' painting materials and time.

Fading Colours

The most dramatic change is probably the fading of colours of organic origin, which Hilliard probably used amongst other applications to model the features of fair ladies.

3. Nicholas Frayling, PhD student at the V&A/RCA conservation course was fundamental in making Tudor miniatures and their techniques more accessible using digital media and the latest computer software. (Frayling, N. 1998) Together with Alan Derbyshire he was the first to combine source research, instrumental analysis, practical reconstruction and computer image manipulation.

Many portraits of Queen Elizabeth I appear unusually pale with white faces, faint red cheeks and red lips. This caused the notion that Hilliard's portraits are particularly flat and mask-like. Due to the fashion of the time and 'make up', portraits of ladies were certainly much paler than those of male sitters. However they still might have had a subtle modelling. This is suggested by the portrait of Elizabeth, which was kept inside a jewelled pendent, presented to Sir Francis Drake. In comparison to those portraits of her which were more exposed to light this picture shows much stronger modelling and colour (see Figure 2). Some of the male portraits like Hilliard's self-portrait (see figure 1) seem to be less faded. Hilliard's treatise suggests that he tended to use (lightfast) earth colours for male sitters for a more dark or sunburned complexion.



FIG.2 DETAIL FROM HILLIARD'S PORTRAIT OF QUEEN ELIZABETH, C. 1600 (SEE FIGURES5) AND THE PORTRAIT MOUNTED IN THE 'DRAKE JEWEL', PRIVATE COLLECTION PRESENTLY ON DISPLAY IN THE BRITISH GALLERIES OF THE V&A. THE MINIATURE MOUNTED IN THE LOCKET SHOWS CLEARLY LESS FADING

Silver

The most evident blemishes for the non-conservator are the dark dots on the pearls, caused by tarnished silver. Other treatises suggest protecting silver with garlic juice. Garlic seems to be a strange choice as it contains sulphur, which is well known to promote the tarnishing of silver. It also needs to be considered, that any (more effective) protective layers of gum or varnish could have been removed through abrasion or later cleaning attempts with solvents such as alcohol. To show the splendour of how the silver highlights really should have looked, computer manipulation is a great tool. Nick Frayling has provided stunning examples how to utilise digital media and the computer in combination with reconstruction for a better understanding of the original appearance of Tudor miniatures³.

Artificial Gemstones

Less obvious, unless viewed with the microscope, is the vanished sparkle of artificial gemstones. Reconstruction experiments have suggested that some of those stones might have been squashed not too long after their making by a cover glass or careless handling (see figure 2). During reconstruction (based on the treatises) the viscous honey-like Venetian turpentine (in our case, larch resin) was mixed with pigments (Indian lake for a ruby, verdigris for an emerald and ultramarine for a sapphire). The resin was applied with a hot needle, in a warm room or near a heating source, on top of a burnished silver ground (see figure 3). Further heat was required for the stringy resin to settle from the shape of a stringy, 'dwarf hat' into a round dome. To pick up the right amount of resin is quite difficult and to pick up too much is very tempting as the sparkling resin dome looks great at first. However, the thickly applied resin on the reconstruction was not dry even after a period of several months, and some stones were accidentally squashed by handling. Indeed there is evidence in some treatises that limners experienced the same problem. There are clear warnings to observe certain drying times⁴. But even if the pigmented Venetian turpentine resin had time to dry without being squashed, the thick layer of resin tended to be brittle and crack after some time. Hilliard often depicted enamelled miniature lockets in miniatures by coating them with resin. Those in some cases chipped off completely, leaving the blank parchment or a (meanwhile tarnished) silver ground. Variations in the technique can be observed on Hilliard's later miniatures. Instead of applying a thick layer of resin Hilliard tried to apply a thinner layer of coloured resin on a silver coated thick blob of lead white. But unfortunately, as mentioned, also raised layers of lead white tended to crack and chip off, leaving blank parchment.

4. The most detailed description of making a ruby can be found in a manuscript by Daniel King, DL Add. 12461 MS.



FIG.3 DETAIL OF A RUBY, NICHLAS HILLIARD, ELIZABETH I (V&A, 622-1882) [PHOTO BY NICHOLAS FRAYLING]. RECONSTRUCTION OF A RUBY

Craquelure – Too Gummy?

Each pigment requires a different ratio of pigment and binder. A good method to determine the right ratio was to mix the paint up in a shell. Pigment (which was stored dry in paper or boxes) and powdered gum were mixed with a drop of purified water using the ring finger. If the dried colour in the shell formed a shiny layer like oil

paint there was too much gum. If there was too little, the paint would powder off. If the ratio was right, the paint would smear thinly on the smooth surfaces of the shell and neither crack nor shine (and also made it easier to detect impurities as specks of dust). Some effects and some pigments required more gum than usual. Indian lake needed gum for its colour and ivory black was working better when gummed freshly just before it was used for painting. In the case of the paint used for the lace, gum was required for the shiny effect and the 'impasto' consistency. In all these cases it was easy to use accidentally more gum than required. For this reason areas where such paints were used (red background, eye centre, black costume, lace) show an increased tendency for craquelure and for flaking.

FIG.4 DETAIL OF THE LACE (~4MM), NICHOLAS HILLIARD (V&A, P.3-1974) AND A UV IMAGE OF NICHOLAS HILLIARD'S WIFE ALICE, BY NICHOLAS HILLIARD, DIA. 59MM, (V&A, P.154-1910) THE UV IMAGE SHOWS THE EXTEND OF LOSS IN THE AREA OF THE RUFF AND ALSO THE DIFFERENCES IN THE THICKNESS OF THE WHITE PAINT LAYERS



Due to their enormous historical and artistic value Hilliard's limnings are treated by conservators as sparsely and non-invasively as possible. They are rarely opened and are usually not permitted to travel and further subjected to a strict lighting and display policy. The most common reason to open these early miniatures is their need for consolidation. The fine craquelure and flaking of paint might be not obvious with the naked eye but easily detected under the microscope. Flaking of the lead white, in the thickly applied paint layers of the ruff and costume, is possibly the most serious deterioration phenomenon on Hilliard's work and other limnings. The difference in the thickness of the lead white paint layer in the face area (very thin) in the ruff (very thick), (and losses of paint) can be clearly seen with x-ray spectroscopy and with the help of UV examination (see figure 6).

Lead white purification

Hilliard and other sources mention lead white and ceruse as prime pigments for white paint. According to the most recent hypothesis, the difference in the colour terms might refer to different stages of preparation or different grades of quality

rather than different chemical compositions. Raman analysis on some of the most prominent miniatures by Hilliard in the V&A unambiguously detected only lead white (basic lead (II) carbonate – $2\text{PbCO}_3 \cdot \text{Pb}(\text{OH})_2$) in all examined white areas (Derbyshire 1999). Interestingly there is only minor evidence for the blackening of lead white, which is a more common phenomenon in later portrait miniatures, in particular of the late 17th century. This is likely to be the result of careful preparation methods, which are described in great detail in the treatises. As Hoskins says:

it will be no lost labour to be curious in this Colour, because it is the ground & foundation of all your other works, for if this become faulty, all is lost & cast away. The experience whereof does frequently appear in many excellent peices, being heightned with white lead unprepared are spoild & the Colour all rusty & dead (Hoskins MS Copy, NAL-R.C.A.20-995: 31).

Analysing these recipes, the limners seemed to have picked out the whitest flakes from yet un-ground flake white from the outer crust of the lead coil⁵. Like this they were able to avoid contamination with pure lead splinters or yellow/grey rusty flakes from the inside of the coil. These snow white flakes were ground and the hairs/dust and water-soluble salts (as lead acetate) were washed away with distilled water (till the water had no harsh taste anymore). The remaining product was dried in the sun or a chalkstone slab. To achieve the powdery appearance of lead white paint, which was required for the carnation – Hilliard had to remove the fine lead white particles by washing. During this process the ground flake white pigment was stirred in distilled water, after a short while the floating fine particles were decanted in a separate shell or container. (When dry these very fine particles were rapped in paper and later mixed with gum for the glossy lace and pearls.) Then the mixture was stirred again and after a shorter period the floating particles were decanted in a different container. This middle portion was ideal for painting non-glossy areas. The bottom layer of big heavy particles was ground again and the process repeated. This simple method of particle separation was used for nearly all pigments as it is crucial to remove dust, the too fine particles and the too coarse ones.

Mineral blues

The correct application and preparation of natural ultramarine pigment still largely remains a mystery. There is no doubt anymore (due to analysis) that Hilliard used un-adulterated mineral blues (made from lapis lazuli and azurite). His blue backgrounds are surprisingly strong in colour and at the same time very fine and smooth. Limners probably purchased blue pigments made of the best quality raw material. It is unlikely that limners produced these pigments directly from the gemstones, as the preparation was a well kept secret and required probably large quantities of the raw material (Hilliard mentions ultramarine from Venice and notes its enormous costs). Again limners purified the pigment by removing very fine particles. This is of the greatest importance as particles under 5 microns appear to be colourless and would settle on the surface spoiling the blue colour underneath with a greenish or greyish cloud.

5. Lead white was produced by suspending a coil of lead in a glass or ceramic container above vinegar in a warm carbon dioxide rich environment (recommended is a barrel with horse dung).

6. The following book is very much recommended. It shows amazing pictures from a traditional Indian miniature workshop, The materials and techniques are reminiscent to those described in the treatises: Lazaro 2005.

7. Hoskins MS Copy, NAL-R.C.A.20-995, fol.35.

The second step was again to remove coarse particles, which would hinder a smooth application and the final burnishing of the paint. This is a very narrow line. Approximate evaluation of the particle sizes of the blue pigments under high magnification showed a minimum of 5 microns, an average of 10 microns and a maximum of about 25. How the blue has been laid down can best be learned from contemporary Indian miniature painters or those miniature painters still working in the Islamic manuscript tradition⁶. However, as experienced by the author there is a great difference between watching and doing it yourself. Even ignoring the lack of good quality pigment and experience, it seemed to be generally a nerve-racking and difficult business.

FIG.5 NICHOLAS HILLIARD, ELIZABETH, C. 1600, OVAL, 64.5X49MM (V&A, P.1-1974). A QUANTITY OF GOOD QUALITY AZURITE HAS BEEN SEPARATED INTO VARIOUS COLOUR SHADES AND GRAIN SIZES BY THE METHOD OF 'WASHING'. THE SHELL IN THE MIDDLE IS THE ONE HILLIARD WOULD HAVE USED (THE PIGMENT IS NOT TOO COARSE, NOT TOO FINE AND HAS A GOOD COLOUR)



Black is not black

The most satisfying was the reconstruction of black pigments. According to the treatises some limners prepared black pigments themselves from the raw materials. Only in this way could they ensure the quality and authenticity of their final product. And limners were very specific what they wanted: namely cherrystone and Ivory black. Cherrystones consist of very dense almost grain-less wood. During the charring process organic materials keep their original shape – a nutshell, a plum stone or a willow twig when charred would produce different pigments, of different texture and shade. Cherrystones produce a black paint with very fine regular particles, which is very nice to work with. The shade it produces is of a silvery grey/black colour. Charring fruit stones turned out to be relatively easy. They were placed in a metal container with a loose lid and placed in an ordinary burning wood stove. Within a quarter of an hour, coloured flames escape the container and the process is then finished. Charring is a reduction process – the less oxygen enters the container the better. In the case of ivory the temperatures needed to be somewhat higher. Hoskins says that the iron container needs to be of a dark red colour for about an hour. According to Hoskins MS the container was fully packed with ivory splinters and 'luted' (sealed) with a mixture of wet clay mixed with salt⁷. (The salt probably prevents sudden shrinkage of the clay. The woodstove was heated with coal to its full temperature and the container left inside till the stove cooled down. All this is described in some detail in the treatises. But every treatise seems to provide only a tiny piece of information. The combination of all sources was needed to reproduce

the recipe in reality is a key for understanding what is meant. After this experience there was little doubt that it was easy for the miniature painters to collect scraps of broken ivory, combs, scrapings from sculptors etc and produce their own pigment from scratch to achieve exactly the effects they wanted to. The amazing detail of Hilliard's costumes shows it was well worth the effort.



FIG.6 DETAIL OF THE BLACK COSTUME. NICHOLAS HILLIARD. UNKNOWN LADY, 1590-93, OVAL, 59X47MM (V&A, P.9-1947). IVORY BLACK AFTER BREAKING THE CLAY SEAL OF THE CRUCIBLE USED FOR RECONSTRUCTION. PAINT MADE FROM THE RECONSTRUCTED IVORY BLACK SEEMED TO FLAKE IN A SIMILAR WAY AS THE BLACK PAINT IN THE MINIATURE (LOWER EDGE) ALSO DID THE PAINT AN IRREGULAR SHINE SIMILAR TO THE ONE ON THIS MINIATURE

Summary

The research into 16th century limnings is far from being finished. It rather feels that it has just been started. Further research for instance might include exploring the link with earlier manuscript illumination (i.e. Ghent Bruges School). Reconstruction provided a few new insights as well as many new questions. Which was surprising as Hilliard's technique was always thought to be well understood due to the abundance of treatises based on it. However, today we know that not all of the information given is necessarily correct. Also we became more aware that the appearance of artefacts today is not necessarily the appearance intended by the artist. To study the artists intentions, the cultural circumstances in which a work of art was produced and to learn about the methods and techniques it was made with, greatly adds to the art works' value and appreciation. ●

Acknowledgments

We greatly want to thank the large number of people investing time, sharing their knowledge and resources in helping with the research and reconstruction work on Hilliard's materials and techniques: First of all the Royal College of Art and the V&A Museum, which provided an amazing platform for the research, thanks to William Lindsay, Nick Frayling and Katherine Coombs. We also want to thank Carmen Krisai-Chizzola, Mike Wheeler, Dr. Georg Kremer (Kremer pigments), David Margulies, Anita Chowdry, Dr. Spike Bucklow, Dr. Mark Clarke and the scientists: Dr. Robert Withnall, Dr. Lucia Burgio and Dr. Vincent Daniels.

Bibliography

- Auerbach, E.. 1961. *Nicholas Hilliard*. London: Routledge and Kegan Paul.
- Browne, A.. 1679. *Ars Pictora*. London.
- Derbyshire, A. and R. Withnall. 1999. 'Pigment Analysis of Portrait Miniatures Using Raman Microscopy.' *Journal of Raman Spectroscopy* 30, 185-188.
- Frayling, N.. 1998. 'An exploration of the original appearance of Nicholas Hilliard's portrait miniatures using computer image manipulation.' *V&A Conservation Journal* 28, July 1998, 4-6.
- Lazaro, D. P.. 2005. *Materials, Methods and Symbolism in the Pichhvai painting tradition of Rajasthan*. Ahmedabad: Mapin Publishing.
- Muller, J. M. and J. Murrell (1997) *Edward Norgate, Miniatura or the Arte of Limning*. New Haven & London: Yale University Press.
- Murrell, J.. 1983. *The Way Howe to Lymne – Tudor Miniatures Observed*. London: V&A Publications. Peacham H.. 1622 *The Compleat Gentleman*. London.
- Reynolds, Graham. 2006; *The Sixteenth and Seventeenth-Century Miniatures in the Collection of Her Majesty The Queen*, Royal Collection Publications Ltd.
- Tallian, T.. 2007. *Reconstruction of Nicholas Hilliard's Materials and Techniques*, a thesis submitted in partial fulfilment of the requirements of the Royal College of Art for the degree of Master of Philosophy, May 2007, The Royal College of Art / Victoria and Albert Museum, London.
- Thornton R. K. R. and T. G. S. Cain. 1992. *The Arte of Limning by Edward Norgate*. Manchester: Carcanet Press.

Biographies

Timea Tallian studied art history and fine art before she joined the conservation course at the Academy of fine Arts in Vienna (MA in 2003). Initially trained as paper conservator she developed a strong interest for ethnographical objects, portrait miniatures and the study of miniature painting techniques in general. In 2003 she embarked on a research project, at the V&A/RCA postgraduate conservation course, focusing on the practical reconstruction of Hilliard's materials and techniques (Mphil 2007). After a year break, working as conservation consultant in Bhutan, she is back in London, presently working as a free lance conservator. Timea is affiliated with the Ethnographical Museum, Vienna and the V&A Museum, London. Email:- timea.tallian@network.rca.ac.uk

Alan Derbyshire obtained a BSc in Physics from U.M.I.S.T. in 1975 before going on to study paper conservation at Gateshead Technical College. He is Head of Paper, Books and Paintings Conservation at the Victoria and Albert Museum, where he has worked since 1983. For the last twenty years he has specialised in the conservation of portrait miniatures on ivory and vellum. He has written, taught and lectured extensively on the conservation of works of art on paper and on portrait miniatures. He is an accredited member of ICON. Email: aland@vam.ac.uk, Address: Paper Conservation, Victoria and Albert Museum, London SW7 2RL, Telephone:- 0207 942 2113