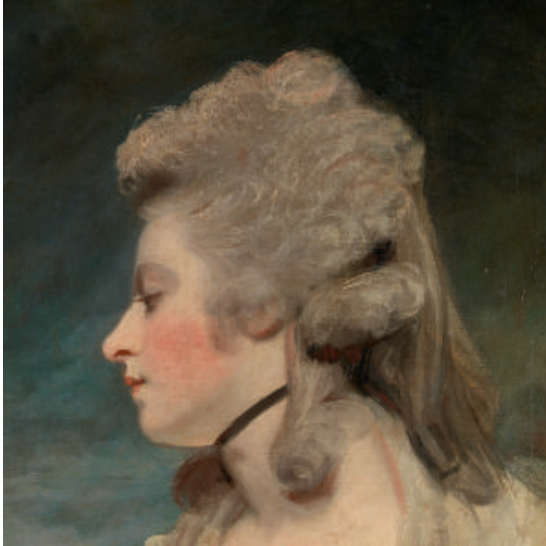


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FRONT COVER

Joshua Reynolds, *Lady Cockburn and her Three Eldest Sons* (NG 2077), 1773 (detail)

TITLE PAGE

TOP LEFT: Joshua Reynolds, *Mrs Mary Robinson ('Perdita')*, The Wallace Collection (P 45), 1783–4 (detail).
TOP RIGHT: Joshua Reynolds, *Colonel Tarleton*, The National Gallery (NG 5985), 1782 (detail).
BOTTOM LEFT: Joshua Reynolds, *Miss Jane Bowles*, The Wallace Collection (P 36), 1775–6 (detail).
BOTTOM RIGHT: Joshua Reynolds, *Mrs Susanna Hoare and Child*, The Wallace Collection (P 32), 1763–4 (detail).

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Practice Makes Imperfect: Reynolds's Painting Technique

ALEXANDRA GENT, ASHOK ROY AND RACHEL MORRISON

Sir Joshua Reynolds's painting practice, his techniques and his individuality as a practitioner have attracted more than 250 years of speculation, interpretation, misapprehension and frustration – this last response being that of some of his clients on seeing their pictures decay.¹ In the twentieth and twenty-first centuries his works have challenged the formulation of sound conservation procedures for paintings of spectacularly unpredictable behaviour to treatment, particularly cleaning. It is therefore worth considering to what extent Reynolds was really out on a limb among his contemporaries as far as his procedures were concerned, there having been a number of attempts to account for his erratic choices and seemingly ill-considered painting materials. In general it has been assumed that the relative decline of a hierarchical workshop, apprentice and assistant system of studio organisation and picture production from the golden days of Rubens and Van Dyck, and the concomitant loss of the implied traditional training this involved, confronted aspiring painters in England with a changed economic order. Lengthy training in traditional skills was unlikely to guarantee sufficiently quick success, nor to produce early on a large independent client base yielding commensurate regular income.

As Nicholas Penny has argued,² Reynolds's desire to be an independent and quickly successful society painter must have led him to worry less about the soundness or durability of his technique and more about his capacity to concoct the qualities and substance of paint that would encourage clients to bestow praise on his emulation of great masters from Italy (as well as Rembrandt), provided, of course, that he could also draw – which he certainly could. Therefore, it may not be necessary to invoke his early pharmaceutical training, or even a suggested interest in protochemistry,³ in order to explain his elaborate and sometimes disastrous technique, nor necessarily to see it as a complete departure from the principles of his times. For example, in Volume 1 of Robert Dossie's *Handmaid to the Arts* (first published in 1758), which as its publishing history attests may well have been one of the more influential English practical treatises on painting and other arts, interestingly the author approves of painting in a mixed medium of

'varnish' and oil,⁴ later seen as one of Reynolds's more unhappy proclivities:

It has lately been a practice with some eminent portrait painters, to make a compound vehicle by mixing oils and varnish together: and this likewise is, by them, called *painting in varnish*; though it ought, I think, rather to be called *painting with varnish* [Dossie's italics]. The advantage that has principally induced them to use this method, is the quick drying of the colours, which is the result of it: but time will shew them another greater advantage in it; I mean the preservation of the colours, to which it will greatly contribute.⁵

Later in his handbook, Dossie goes on to describe in more detail the methods and materials, particularly the considerable range of pigments suitable for the technique of 'painting with varnish': those capable of being reduced to 'impalpable powders' and those of 'cohering texture'. This is all described in a way that suggests oil and resin mixed media were entirely respectable techniques for easel painting and, in fact, to be commended as superior to simple oil painting, for which the most commonly employed medium of linseed oil, with or without dryers, was regarded with some suspicion for its well-known propensity to dry imperfectly and to darken badly with certain pigments.

It has been a consistent observation of painting conservators faced with the problems – real and imagined – that paintings by Reynolds might present, that certain of his pictures are painted in a straightforward and largely durable manner, and are 'well-behaved' in the sense of their responses to conservation, while others are so complex, multilayered and heterogeneous in constitution as to be untreatable by conventional means. This has proved the case with one work in the National Gallery's Collection: *Lord Heathfield of Gibraltar* (CAT. 15), which was examined and analysed as a preliminary to proposed conservation work in 2009.⁶

It is possible that Reynolds's formative experiences in Rome, where he evidently attempted to reconstruct by observation and thought the techniques used in the

are recorded, in other cases the media are noted and on several occasions the faults of technique are mentioned. Where these original notes are quoted here, they are described as Reynolds's 'Technical Notes'.

Supports

Canvas

Reynolds painted very largely using canvas as his support. Until 1770 he used almost exclusively plain-weave canvases, but after 1770 he began to employ twill weave. By the 1780s he generally favoured twill canvas (FIGS 8, 9).⁹ The weave pattern is consistent for all the twill canvases examined, with each weft thread passing over two warp threads, then under one. His canvases show evidence of having been prepared commercially by artists' colourmen for the most part, and the majority of Reynolds's paintings conform to standard picture sizes for paintings in the eighteenth century.¹⁰ As might be expected, it is generally larger canvases, used for portraits of multiple sitters, fancy pictures and equestrian portraits, that do not conform to the standard sizes and were probably made to order when these paintings were commissioned.¹¹ Of the seventeen canvas paintings described here, all are convincingly close in size to a standard format except *Mrs Susanna Hoare and Child* (CAT. 5), which has dimensions between those for a half-length and a bishop's half-length.

In Reynolds's ledgers he notes the support he used only on four occasions. In three cases this is recorded as a 'raw cloth'¹² and in one case as '*una tela di fundo*'



FIG. 8 Joshua Reynolds, *Mrs Elizabeth Carnac* (CAT. 9), detail of X-radiograph in the area of the sitter's eye showing twill-weave canvas.

which has also been interpreted as being an unprepared canvas.¹³ The support for the Plympton *Self Portrait* (Private Collection) is further designated as 'a common Colourmans Cloth'.¹⁴ Joseph Farington noted that *The Nativity* (another of the paintings referred to in the 'Technical Notes'), which was owned by the Duke of Rutland (and later destroyed in the fire at Belvoir Castle), was restored by Marchi, who was unable to line the painting as it had been painted 'on a floor Cloth canvas doubled'.¹⁵

Both the portrait of Mrs Robinson at the Yale Center for British Art (see CAT. 14, FIG. 186) and the *Studio Experiments in Colour and Media* at the Royal Academy (see FIG. 25) retain their original secondary supports in the form of fixed cornered strainers, which were commonplace in the period (FIG. 10). However, towards the middle part of the eighteenth century expandable stretchers became available. Although the stretcher on *The 4th Duke of Queensberry ('Old Q') as Earl of March* (CAT. 2, FIG. 47) is not original, it is likely that it dates from the late eighteenth or very early nineteenth century and, with keyed diagonal corner braces, it bears a strong resemblance to a stretcher from an unlined painting by John Webber dated 1785.¹⁶ Larger strainers would have had cross-bars, which were not always secure. In a letter to Frederick 5th Earl of Carlisle, Reynolds refers to damage that had been caused by a bar working loose in transit.¹⁷

Reynolds, like his heroes Titian and Rembrandt, was inclined to reuse canvases. X-ray images of a number of his paintings have revealed inverted portraits beneath an upper composition (FIG. 11). In the case of two sketches for equestrian portraits now at the Dulwich Picture Gallery (*An Officer on Horseback*, DPG333) and the Yale Center for British Art (*Sir Jeffrey Amherst*,

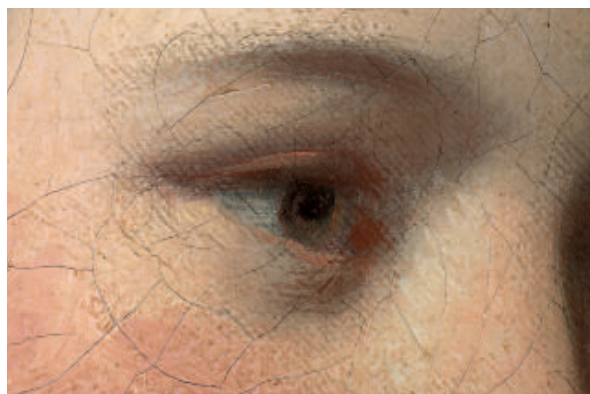


FIG. 9 Joshua Reynolds, *Mrs Elizabeth Carnac* (CAT. 9), detail of eye showing the texture of the twill-weave canvas in the paint in an area corresponding with FIG. 8.



FIG. 10 Joshua Reynolds, *Mrs Robinson*, about 1784. Canvas, 88.6 × 68.9 cm. Yale Center for British Art, New Haven, Inv. B1981.25.520, reverse.



FIG. 11 Joshua Reynolds, *Sir Jeffrey Amherst*, about 1768. Canvas, 76.2 × 63.5 cm. Yale Center for British Art, New Haven, Inv. B1981.25.522. X-radiograph showing two portraits beneath the upper composition.

B1981.25.522), the canvases have been reused twice, and there are two overpainted portraits below each painted sketch.¹⁸

Wood

Panel supports were not much used in England in the early eighteenth century, but as artists began to experiment more with additives to their paint media, solid supports were sometimes employed.¹⁹ Reynolds used panel supports for fewer than 50 paintings, a small proportion of his total output of over 2,000 works.²⁰ The majority of the documented paintings on wood are bust-length and date from the later part of his career.²¹ As well as full-size paintings, Reynolds occasionally used panels for small oil sketches. Although the wood has not been identified in most cases, where it has been, the panels are generally made from mahogany.²² However, the portraits of Mrs Jane Braddyll (CAT. 16) and her husband Mr Wilson Braddyll (Private Collection) are both executed on oak panels made of several horizontal boards (four and five respectively, FIG. 12).²³ Although it is unusual for a portrait-format panel to have horizontal joins, the *Self Portrait* in the Royal Collection



FIG. 12 Joshua Reynolds, *Mrs Jane Braddyll* (CAT. 16), reverse.

(RCIN 400699) is also made from five horizontal boards, although in this case the wood is the more standard mahogany.²⁴ The portrait of William Chambers (Royal Academy, 03/704) is made of four vertical boards with smaller additions at the top and bottom edges.²⁵ In contrast, *George IV when Prince of Wales* (Tate, N00890) is executed on a highly finished mahogany panel with a single vertical join.²⁶ The *Self Portrait* in the Royal Academy (03/1394) is painted on a large mahogany panel without joins.²⁷ On Reynolds's death, several large unused panels were left in his studio, which his niece, Lady Inchiquin, gave to the artist Joseph Farington.²⁸

Metal

Reynolds used metal as a support even less frequently than wood, but two portraits exist that are painted on sheet metal. A bust-length portrait, *Luke Gardiner, Lord Mountjoy* (Private Collection), probably dating to 1773, is painted on a metal support that is thought to be tin or, more probably, tin-coated copper.²⁹ The half-length portrait of the brewer Samuel Whitbread painted in 1786–7 (Private Collection) is on a copper support. As the brewing industry used large copper vessels it is an attractive thought that Whitbread may have provided the metal support himself.³⁰ Anecdotally, Samuel Johnson is said to have asked Reynolds why he did not use copper more often as he considered it a more durable support than canvas. Reynolds replied that he did not use it due to the difficulty of obtaining large enough pieces. In rebuttal, Johnson pointed out that their friend, the brewer Henry Thrale, had a large amount of copper, which he humorously asserted that Reynolds could 'paint it all round if you will . . . it will serve him to brew in afterwards'.³¹

Preparatory layers

Whatever his chosen support – which in the majority of cases was canvas – some type of ground or preparation was usually thought to be necessary, and various options were described in the contemporary literature. In a letter to his brother, Northcote states that Reynolds 'always paints on a bare cloath unprepared, after the manner of the Venetians...'³² The 'raw cloth' referred to in Reynolds's ledgers would almost certainly have been an unprimed canvas, but it may have been noted on

these occasions as it was in fact unusual in his practice.³³ Technical analysis of paintings by Reynolds has shown that in most cases a ground layer is present and we have confirmed that this is the case for all the paintings examined here.³⁴ However, it has been suggested that a true ground layer may have been absent when a wax medium was used.³⁵

It seems most likely that Reynolds, in common with his contemporaries, generally used canvases that were commercially prepared with a ground. By the middle of the eighteenth century, pre-prepared canvases were standard articles of commerce for many suppliers in this market. The tacking margins on the portrait of the Duke of Queensberry (CAT. 2) are intact, and the ground extends over the left tacking margin to a cut edge, indicating that it was applied to a larger piece of canvas that was then cut to size. In the paintings examined here, strong cusping is very rarely evident on all four sides and is often observable on only one or two sides of a canvas, suggesting that the canvases were prepared as larger pieces of fabric and then cut to size. An English source as early as 1668 alludes to the ready availability of pre-primed cloth for painting: 'I could teach you how to prime it [cloth], but it is a moiling work, and besides, it may be bought ready primed cheaper and better than you can do it your self. Few Painters (though they all can do it) prime it themselves, but buy it ready done.'³⁶ In the catalogues for the 1739 studio sale of the artist Charles Jervas both 'Raw' and 'Primed' cloths were itemised; however, there were 102 primed cloths listed compared to only ten raw cloths.³⁷ In his 1758 handbook, Dossie mentions that most painters use pre-primed canvas, although warns that the priming is often faulty and can peel and flake off or cause colours to sink.³⁸

The canvases were usually given a coating of glue size before the application of the ground. A sample cross-section from *The Duke of Queensberry* shows this size layer clearly. In his instruction manual on oil painting, although this is rather later, Julius Caesar Ibbetson describes the colourmen as 'brushing the cloth over with strong glue, to lay the flue, and prevent it absorbing any oil'.³⁹

Throughout his long and productive career Reynolds was notably consistent in his use of light-coloured or white grounds. Until the 1760s the canvases tend to have double grounds, and this seems to be the case for the five paintings discussed here, which range in date from 1756 to 1763–4. In each example the two layers of ground are separated by a thin translucent layer, which

appears fluorescent in ultraviolet light under the microscope (FIG. 13). In the case of *The Duke of Queensberry* this was identified by FTIR-microscopy as a proteinaceous material, and is likely to be a thin layer of glue size. The earlier canvases have also been observed to exhibit a surface texture of fine grooves, which must have been made by the tool used to apply the ground. The double layer and characteristic texture are common in grounds in England from 1730 to 1760, and probably provide strong evidence that the grounds were applied by the suppliers.⁴⁰ Ibbetson describes colourmen as applying two, and occasionally three, layers of ground made of 'stiff paint, the greatest part of which is whiting'.⁴¹ The double grounds that we have analysed all contain a large proportion of calcium carbonate with some lead white, and the hue varies from beige or off-white to light grey. Rounded coccolith microfossils with additional sickle-shaped or needle-like inclusions are visible in many of the cross-sections, indicating that the calcium carbonate is in the form of natural (sedimentary) chalk.⁴² Similar grounds are present on *Captain Robert Orme* (CAT. 1), *Miss Nelly O'Brien* (CAT. 4) and *Mrs Susanna Hoare and Child* (CAT. 5), each of which also has incorporated a little yellow earth pigment in the mixture. In the case of *Mrs Hoare* there is also some carbon black. *The Duke of Queensberry* has a more strongly toned beige ground with rather more earth pigment and some large particles of black, probably charcoal, whereas the ground on *Anne, 2nd Countess of Albemarle* (CAT. 3) is a

cooler grey colour and contains only charcoal black combined with the bulk lead white and chalk mixture.

For the paintings dating after about 1765 the ground seems to be applied differently: in a single layer. From the 1770s onwards the grounds are almost pure white. However, some calcium carbonate, in the form of natural chalk, is generally present mixed with the lead white (a few coloured aggregate particles of Prussian blue or black, are sometimes visible in cross-sections).⁴³ Even later, paintings with off-white grounds appear once more. For example, in the portrait of Mrs Mary Robinson (CAT. 14), dating from 1783–4, a proportion of iron oxide red pigment was incorporated into the ground to create a warm, or pinkish, off-white tone.

In one 'Technical Note', Reynolds appears to describe applying a layer of copal varnish to a canvas before painting.⁴⁴ It is perhaps meaningful that a varnish layer containing pine resin and heat-bodied linseed oil was found beneath the pale grey ground layer on the wooden support of *Mrs Jane Braddyll* (CAT. 16). This panel may be the only painting of those described here that does not employ a commercially prepared support; it is also the only ground layer that does not contain some chalk. The presence of bone black specifically, in addition to other carbon blacks, is also unusual in comparison to the other grounds identified here, but it is relevant that bone black is a pigment frequently employed by Reynolds.

The binding medium of the ground layers was analysed in four paintings differing in date. In each case

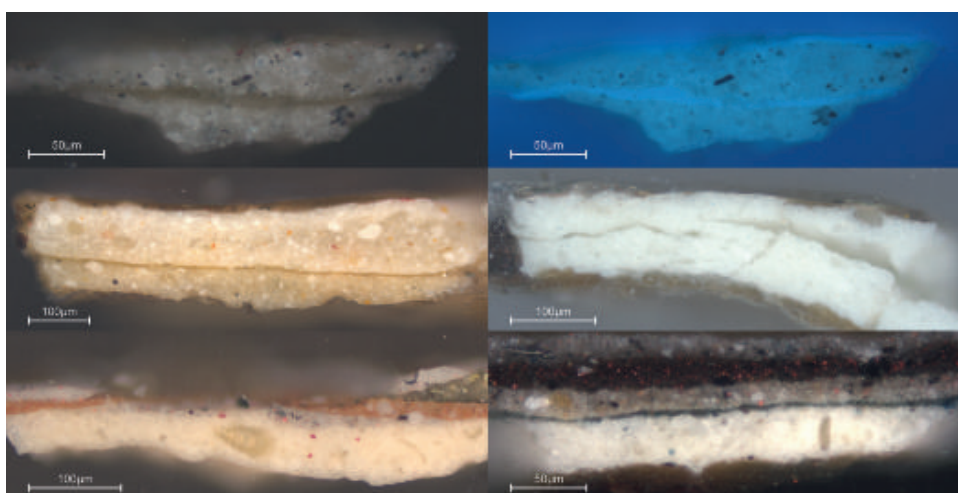


FIG. 13 Cross-section samples showing variations in Joshua Reynolds's grounds.

Top row: *Anne, 2nd Countess Albermarle* (CAT. 3), cross-section of grey double ground in visible (left) and ultraviolet (right) illumination.

Middle row: *Mrs Susanna Hoare and Child* (CAT. 5), cross-section showing double ground (left); *Mrs Elizabeth Carnac* (CAT. 9), cross-section showing white ground (right).

Bottom row: *Mrs Mary Robinson* (CAT. 14), cross-section showing ground below paint layers (left); *Mrs Jane Braddyll* (CAT. 16), cross-section showing ground below several paint layers (right).

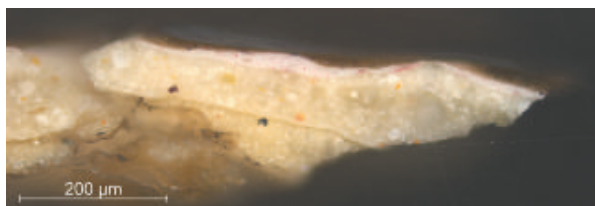


FIG. 14 Joshua Reynolds, *Mrs Susanna Hoare and Child* (CAT. 5), cross-section from top edge showing double ground layer and pinkish-red priming.

it was identified as heat-bodied linseed oil, and it may be that linseed oil, which was cheap and had the reputation for good drying properties, particularly when heat-treated, was routinely chosen for ground layers by commercial primers. This seems to be the case in the early examples – *The Countess of Albemarle* and *The Duke of Queensberry* – where a double ground was used, and in the later paintings. Heat-bodied linseed oil was identified as the medium of the white ground on *Miss Jane Bowles* (CAT. 8) and also the ground layer for *Mrs Jane Braddyll*, which unusually may have been applied in Reynolds's studio.

Except for Reynolds's unfinished paintings, the ground layer is generally completely covered by the overlying paint layers of the composition. In the early portraits with double grounds, the texture of the canvas is not generally visible and is fully effaced by the overlying layers of paint. Later, however, the texture of the support became a more prominent feature of Reynolds's technique. In the portrait of Miss Bowles, for example, the pronounced texture of the raised canvas threads has been used to create the dappled effect of sunlight. The texture produced by the thinly primed twill-weave canvas of the later paintings must surely be an intentional effect, although this surface pattern is further emphasised by the trapped residues of discoloured surface coatings as the pictures have come down to us. One of the artists' suppliers from whom Reynolds is said to have purchased materials is John Middleton (whose premises were in London's Long Acre and later St Martin's Lane). In a list of materials published in 1785, Middleton states that 'Portrait painters choose a very thin priming'.⁴⁵

In *Mrs Susanna Hoare and Child* a pinkish-red priming layer, consisting of lead white and an iron oxide red pigment, was identified above the ground applied over the whole canvas (FIGS 14, 15). This is the only painting described here in which a coloured priming was used and therefore, apparently, a rather unusual technical feature for a work by Reynolds.



FIG. 15 Joshua Reynolds, *Mrs Susanna Hoare and Child* (CAT. 5), photomicrograph showing damage in sky, exposing pinkish-red priming under the blue paint of the sky.

Preparation for painting

Reynolds did not as a rule make preparatory drawings for his paintings, nor did he generally use oil sketches to work up his designs. However, both drawings and sketches do survive, although these are more commonly found for his larger and more complex compositions, such as *The 4th Duke of Marlborough and his Family* at Blenheim Palace (FIG. 16).⁴⁶

The substantial part of Reynolds's drawn oeuvre are the many drawings and sketches of paintings he produced during his travels in Italy and Holland, which



FIG. 16 Joshua Reynolds, Sketch for 'The 4th Duke of Marlborough and his Family' about 1777. Canvas, 55.2 × 50.8 cm. Tate, London, Inv. N01840.



FIG. 17 Joshua Reynolds, *A Young Black Man*, about 1770. Canvas, 78.7 × 63.7cm. The Menil Collection, Houston, Inv. 1983-103 DJ.

he later referred to as sources for compositions.⁴⁷ In common with many painters in England in the eighteenth century, Reynolds amassed a large collection of prints and drawings that also provided inspiration and sources for his own painting.⁴⁸ Quite early in his career Reynolds began to work with printmakers in order to record his own paintings and encourage the market for his work. Northcote records that sitters often looked at a book of these prints, which Reynolds kept in his studio, when deciding on poses for their own portraits.⁴⁹

No squaring-up or conventional underdrawing has been found in Reynolds's paintings. Sketchy brushstrokes that loosely mark out the position of his compositions can be seen in unfinished paintings as in, for example, the portrait of a young black sitter, perhaps Francis Barber, now in the Menil Collection, Houston (FIG. 17), and are often also revealed in X-ray and infrared images.⁵⁰ In contrast to these broadly sketched strokes are the finer painted preliminary lines that appear to be associated with the production of multiple versions of a composition. These can be seen in the infrared image of *The Strawberry Girl* from the Wallace Collection (CAT. 6), where the hands and folds of the drapery have been roughly outlined, and in the unfinished sketch for *Mrs Susanna Hoare and Child* in Boston (FIG. 18), in which fine painted red lines were used to delineate the sitter's hands and the child's head and limbs.⁵¹

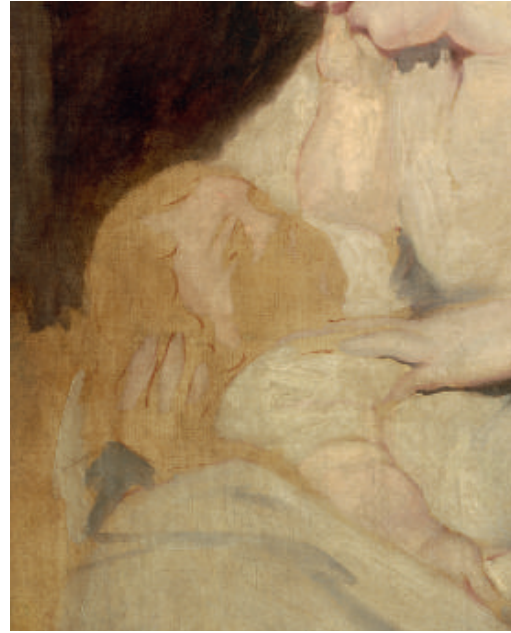


FIG. 18 Joshua Reynolds, *Mrs Richard Hoare holding her Child*, about 1763. Canvas, 75.9 × 63.5 cm. The Museum of Fine Arts, Boston, Inv. 1982.138. Detail showing red painted underdrawing.

Paint application, assistants and drapery painters

It seems that when painting portraits, Reynolds would initially complete the head, and sketch out a rough outline for the drapery and limbs during the sittings themselves. *Mrs Spencer and her Daughter* at Chatsworth (The Devonshire Collections) seems to have been paused at this initial state. From the 'Sitter Books' and more anecdotal contemporary accounts we know that the number of sittings could vary very considerably.⁵²

In William Mason's description of Reynolds's painting technique, which details the sittings for *Robert D'Arcy, 4th Earl of Holderness* (The National Museum of Western Art, Tokyo, P.1969-0004) at which he was present in 1754, he describes him applying a 'ground of white, where he meant to place the head and which was still wet'.⁵³ The X-ray image of *Hon. Anne Seymour Damer* (FIG. 19) shows an area of X-ray-absorbing paint applied in roughly the area of the head, which appears to confirm the use of this technique.⁵⁴ However, this preliminary work does not seem to have been employed for any of the Wallace Collection or National Gallery paintings we have examined in this survey.

Detailed surface examination and stereomicroscopy combined with infrared reflectography suggest that monochrome, or near monochrome, paint layers were sometimes used in underpainting flesh, and then 'tinted



FIG. 19 Joshua Reynolds, *Hon. Mrs Anne Seymour Damer*, 1773. Canvas, 125.7 × 99.1 cm. The Yale Center for British Art, New Haven, Inv. B1987.6.1. Detail of X-radiograph showing area of X-ray-absorbent paint in the area of the sitter's head.

glazes' and rather more opaque 'scumbles' were employed in the finishing layers. This also corresponds with one of Reynolds's 'Technical Notes', from 22 January 1770, in which he states that his established way of painting is to use black, ultramarine and white only in the first and second sittings, and then for the last sitting, yellow ochre, lake, black and ultramarine without white. He finally retouched using white mixed with the other colours. These recorded procedures go some way towards explaining the complex structure seen in Reynolds's pictures.⁵⁵

Reynolds frequently used sequences of small roughly parallel brushstrokes to apply the final touches of colour, both as highlights and in shadow. In *Mrs Elizabeth Carnac* (CAT. 9) four oblique brown strokes have been applied to strengthen the shadow below the bottom lip. Much of the modelling on the face of *Colonel Tarleton* (CAT. 13, FIG. 20) has been applied in this manner, including the highlights on the chin and the shadow at the corner of his proper left eye. Brushmarks can often be seen in the flesh paint, especially in highlighted areas, and show Reynolds's characteristic rapid and vigorous application of paint.

It is known that drapery, backgrounds and accessories were frequently completed, or partially filled in, by drapery painters or studio assistants. The elements of paintings completed by assistants can often appear highly finished: for instance, in comparison with

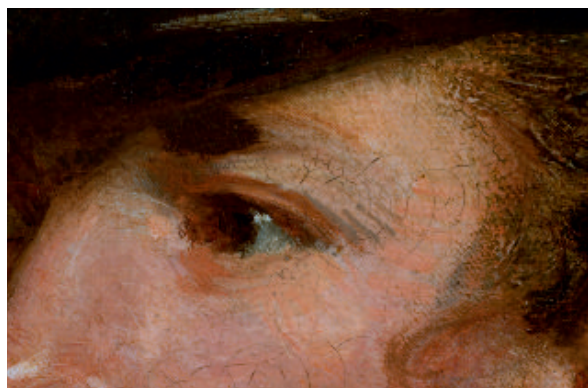


FIG. 20 Joshua Reynolds, *Colonel Tarleton*, (CAT. 13), detail showing hatched brushstrokes around eye.

Reynolds's bravura technique, the table with the locked drawer in *The Ladies Waldegrave* (National Gallery of Scotland; FIG. 21) is laboured and uncreative.⁵⁶ In his 'Sitter Books' Reynolds often uses the term 'dead colour', which had become a widely used descriptive term in eighteenth-century manuals such as *The Practice of Painting and Perspective Made Easy* by Thomas Bardwell,⁵⁷ although it had its origins in seventeenth-century treatises. For Reynolds, 'dead colour' seems to be an underpainting often worked up as a preliminary by assistants or external contractors.⁵⁸ However, once the work of assistants and drapery painters was complete, the whole of the painting was finished by Reynolds himself.⁵⁹ There are cases when X-ray and infrared images reveal changes to the drapery that Reynolds must have made once the painting returned to his easel: for example, the adjustments to the folds of fabric in the portrait of Mrs Carnac.

Compositional changes were also made by Reynolds during the painting process; X-ray images, for example, often revealing that limbs have been shifted in position and outline. In more complicated and ambitious compositions such as *Colonel Tarleton* and *Sarah (Kemble) Siddons as the Tragic Muse* (The Huntington Art Collections, San Marino, California, 21.02) significant changes and suppression of earlier designs can be seen in the X-ray images, while the portrait figures themselves remained relatively unchanged.⁶⁰ When discussing the very large composition of *The Infant Hercules strangling the Serpents* (The State Hermitage Museum, St Petersburg) Reynolds admitted that multiple versions existed beneath the finished painting.⁶¹ Examination of the layer structure (FIG. 22) has proved this to be one of the most multilayered pictures Reynolds ever painted, no doubt worked over again and again to impress his



FIG. 21 Joshua Reynolds, *The Ladies Waldegrave*, 1780. Canvas, 143 × 168.3 cm. Scottish National Gallery, Edinburgh, Inv. NG2171. Purchased with the aid of the Cowan Smith Bequest and the Art Fund 1952.

illustrious patron. Even where they are not as extensive as in the Hermitage picture, cross-sections of Reynolds's work very often show surprisingly large numbers of paint applications, including in areas where changes are minimal. This way of working is perhaps most responsible for the cracking and wrinkling that is such a common feature,⁶² particularly when unusual or poor-drying media are incorporated into the paints. It is clear from our recent studies that this general technical feature contributes more to the cracking of the paints than Reynolds's occasional use of poorly drying bitumen, long seen as the principal agent of deterioration (FIG. 23). Not economical in his use of paint, Reynolds piled layer upon layer to achieve the rich effects he desired, and as close to those of his predecessors he so admired.

Although, over time, many of Reynolds's paintings have revealed problems of condition arising from faulty technique and materials, this should not obscure our admiration for his consistent capacity to handle paint with great skill and invention, an observation that is sometimes only confirmed by close examination of the picture surfaces, even possibly requiring magnification in order to appreciate fully his achievements. Reynolds modulated the stiffness of his thick paints to create a great range of texture, which he then manipulated further with more liquid applications, intensifying colour

and developing form. Draperies may have been worked up wet-in-wet and sometimes scratched into with the end of the brush, or another instrument, to enliven and pattern the surface, in emulation of Rembrandt's manner.⁶³ Other highly effective methods included the application of rapidly worked stiff paint across a surface in broken brushstrokes, suggesting the fall of dappled light, and the classic Venetian look of thick glaze paints applied in varying warm colours (particularly translucent saturated reds) to enrich draperies and backgrounds (CAT. 7). The accidental fluidity in certain of Reynolds's paints has on occasions led it to drip and run, which can



FIG. 22 Joshua Reynolds, *The Infant Hercules Strangling the Serpents* (CAT. 10), about 1788. Canvas, 303 × 297 cm. The State Hermitage Museum, St Petersburg. Paint cross-section showing the great number of paint layers.

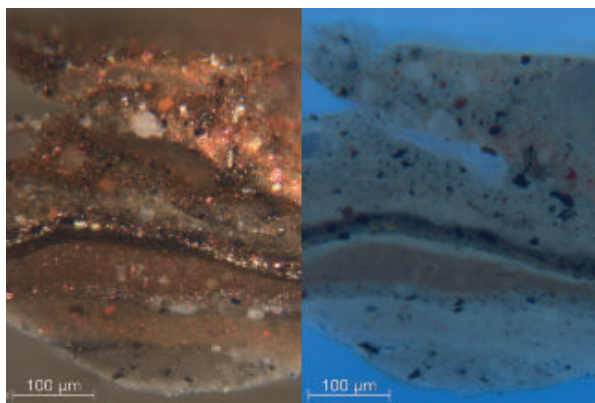


FIG. 23 Joshua Reynolds, *Colonel Tarleton* (CAT. 13), paint cross-section from the smoke filled sky near the horizon at the right edge, photographed in visible and ultraviolet illumination.

be visible on the surface as well as detectable beneath in images provided by X-radiography and infrared reflectography (FIG. 24).

Paint medium

It is the constitution of Reynolds's painting media that has engendered greatest interest, so far as the technique of his paintings is concerned, largely because of what have been seen, since the painter's day, as unconventional and unstable combinations of materials employed as paint vehicles. Further, his frequently multilayered application of paint renders the pictures particularly problematic as vulnerable and unstable objects.

One significant opportunity offered by the study of a group of paintings by Reynolds that range over the course of his career was the chance to investigate the paint media systematically. The 'Technical Notes' in Reynolds's ledgers hint at his use of a wide variety of media materials and suggest that these were applied in complex combinations. However, analytical results exist for only relatively few paintings from his total output.⁶⁴ The analytical study of the paint media in the context of real paintings is not without its challenges. In particular, it is worth remembering that any individual paint sample may not be representative necessarily of the technique of a painting as a whole. For example, the examination of cross-sectional samples illustrates directly the complexity of the paint layer structure in many of the pictures. Therefore it was not always possible to determine how many, or exactly which, of the multiple layers had been included in the samples subjected to medium analysis. This can lead to inconsistent

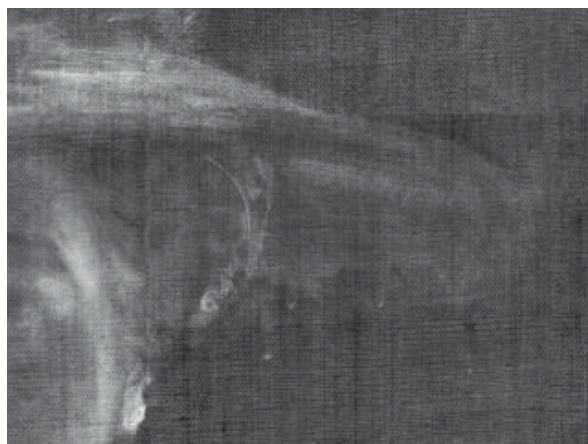


FIG. 24 Joshua Reynolds, *Miss Nelly O'Brien* (CAT. 4), detail from X-radiograph showing runs of paint under the brim of the sitter's hat.

results and difficulties of interpretation. In addition, many of the paintings studied here have in the past undergone relatively little conservation treatment, such as cleaning, and have come down to us covered with numerous layers of varnish, applied at different times to re-saturate the surfaces. With the exception of the synthetic resin varnishes applied in the twentieth century, the materials in these varnish layers – drying oils and natural resins, usually mastic and pine resin – are similar to those that might be expected to be found in Reynolds's paint as binders or additives. Obtaining samples for medium analysis that were uncontaminated by later varnish was therefore highly desirable, although in practice difficult to achieve. Furthermore, the boundary between the original glazes or surface coating layers and subsequently applied varnishes was not always easy to define, nor to demarcate with precision when taking samples. Therefore, in some cases it was not always possible to reach firm conclusions from single analyses, and many of the paint medium results reported here had to be interpreted with a degree of caution by taking account of comparisons with the analyses obtained from samples of varnish. In spite of these difficulties it has been possible to identify several different materials present within Reynolds's paint media and to establish some trends within the range of paintings studied.⁶⁵

Oils

All of the paintings studied here have a paint medium that incorporates drying oil as a significant component, and to that extent are conventional for the period.

Although Reynolds mentions oil on numerous (at least 25) occasions in his 'Technical Notes', no further characterisation or description is given by the artist. The only reference to a specific oil in the Reynolds literature is in an anecdote recounted by Northcote where he is given a jar of old, oxidised nut oil 'grown fat by length of time', while in Devonshire with Dr Johnson in 1762.⁶⁶ Analysis of Reynolds's paintings has confirmed that he certainly did use walnut oil, but also linseed oil and poppyseed oil. In many of the paintings examined, the different paint samples gave results with varying ratios of palmitic to stearic acid (P/S), indicating that more than one type of oil was likely to be present. Poppyseed oil was identified by this means in a white paint from *Lady Cockburn and her Three Eldest Sons* (CAT. 7), and in the portrait of Captain Orme (CAT. 1). On the basis of P/S ratios, poppyseed oil was probably used for the light paint of the sky in *Miss Nelly O'Brien* and possibly also in a beige paint in *Colonel Tarleton*.

Our analysis of the Reynolds palette, now in the collection of the Royal Academy (which was set out by the painter for Mary, Marchioness of Buckingham), showed that the white paint was bound in poppyseed oil, and it seems that the lighter coloured oil was specifically chosen for pale or white passages in the way recommended by contemporary treatises.⁶⁷ In many cases for the paintings examined, the GC-MS results suggested the use of walnut oil, although if a mixture of poppyseed oil and linseed oil had been combined a similar analytical result would have been obtained. In general, for paintings where a mixture of different oils was identified, walnut or poppyseed oils, which were believed to discolour less, were found to be present in the lighter passages, whereas linseed oil occurred more frequently for darker colours.⁶⁸

Analysis has revealed that these drying oils had often been pre-polymerised or thickened by heating prior to their use, at least to some extent.⁶⁹ However, in a few cases oils that had not been heat-bodied were also identified. In the portrait of Captain Orme the poppy oil binder identified in the white paint had not been heat-treated, nor had the linseed oil used for the blue-green paint of the coat, although in other parts of the picture heat-bodied linseed oil was also identified. Linseed oil, which had not been heat-bodied, was used in underpaint for the drapery in *The Duke of Queensberry* and in a lower paint layer in the background of *Lord Heathfield*.

Wax

The appearance in English in 1760 of an account of the ancient method of 'encaustic painting' (using molten beeswax to bind pigments)⁷⁰ – based on rediscoveries of the technique by the Comte de Caylus, French antiquarian and author, published in 1755⁷¹ – must have interested painters in England whose inclinations tended to new effects and experimentation, particularly with media. In fact Müntz submitted a copy of his book along with two examples of encaustic paintings to the Society of Arts in 1760 and a committee was selected to assess the technique, for which Reynolds was proposed as a member.⁷²

There are 32 references to wax in Reynolds's 'Technical Notes' between 1767 and 1779, and there is at least one inscription on the surviving 'experimental canvas' that refers to wax (FIGS 25, 26).⁷³ Reynolds mentions painting with wax only; with a varnish made from Venice turpentine and wax; with wax mixed with varnish; wax and copaiba balsam; and wax with oil. He also mentions using wax and copaiba balsam, as well as wax and Venice turpentine, as a varnish rather than a paint medium. At this time it is likely that the only common form of wax that could have been utilised was beeswax. In 1778 he stated that the best painting method is to use wax with Venice turpentine.⁷⁴ Wax is sometimes recorded for an upper paint layer applied over another medium, as for example in *Lord Henry and Lady Charlotte Spencer* (The Huntington Art Collections, San Marino, California, 23.62), for which Reynolds documents painting first in oil, then with pigments with wax and no oil.⁷⁵ In other examples, wax is used to paint only a specific area of a painting, such as in the portrait of 'Lady Osser', where wax was used exclusively for the face.⁷⁶ Wax also appears to be mentioned as a superficially applied layer: for example, in the portrait of Mrs Sheridan where the face is painted in oil and then waxed ('cerato').⁷⁷

In spite of the many mentions of wax in Reynolds's 'Technical Notes', wax was identified only rarely in the group of paintings studied here. However, the portrait of Miss Bowles may represent a finished example of Reynolds's use of wax as a layer applied over the paint, presumably to give a finishing shine to the surface. In this case, beeswax was identified as a thick layer over what seems to be the entire surface of the painting. The evidence from cross-sectional samples suggests that this layer is likely to be original, since the wax is present

below tinted glaze layers and several subsequent varnish layers. The presence of this layer made it difficult to determine whether wax had also been included in the paint medium, but it is possible that some of the upper layers of paint, particularly the yellow in the foliage of the trees, did include an addition of beeswax in the medium. Beeswax was also identified in small quantities in two paint samples from *Lady Elizabeth Seymour-Conway* (CAT. 12a). For this picture it may have been added to the paint medium for a specific stage of the painting, or it could equally be present as a constituent of an intermediate layer. Samples from *Saint John the Baptist in the Wilderness* (CAT. 10) contained beeswax, which may have been incorporated into the paint.⁷⁸

Although not identified in any of the paintings examined in this study, spermaceti wax – in combination with beeswax and linseed oil – was found in the green drapery of *Self Portrait as a Deaf Man* (Tate, N04505).⁷⁹

Resins

In his 'Technical Notes' Reynolds specifically mentions four resins: mastic, copaiba balsam, Venice turpentine and copal. Northcote reported in a letter to his brother that Reynolds 'uses his colours with varnish of his own because the oils give the colours a dirty yellowness in



FIG. 25 Joshua Reynolds, *Studio Experiments in Colour and Media*, 60.9 × 50.9 cm. Royal Academy of Arts, London.

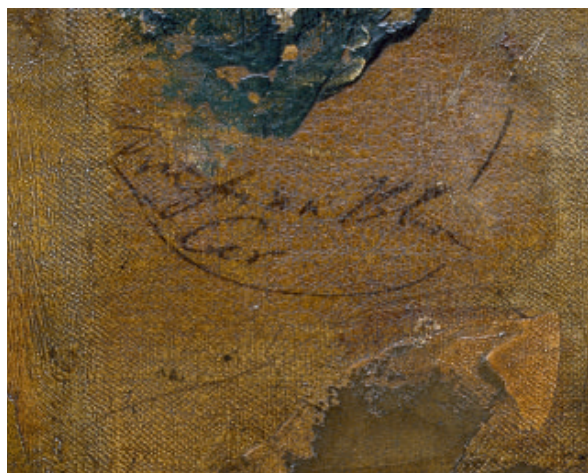


FIG. 26 Joshua Reynolds, *Studio Experiments in Colour and Media*, detail showing blue paint and related inscription 'Prussian Blue Cer', that is 'Prussian blue and wax'.

time'.⁸⁰ In the same letter he mentions that many artists in London mix mastic varnish with their colours. These observations suggest that the addition of some varnish to medium was common practice for Reynolds. The results of analysis confirm that this is the case.

Several different types of natural resin were identified in the course of this study, and a proportion of resin of one variety or another was detected in the paint of the majority of the pictures in our survey, often more than one resin being identified in the same painting. However, if we exclude *Miss Nelly O'Brien*, it seems that the paint medium involves less complicated combinations in the earlier pictures, and no resin has been identified positively in *The Strawberry Girl* or in the early portrait of the Countess of Albemarle. However, even in the paintings where there was only cursory evidence obtained by GC-MS for the inclusion of a little pine resin – as in the portraits of Captain Orme (FIGS 27, 28) and Mrs Hoare, where generally the technique appears more straightforward – the cross-sectional samples from certain areas indicate that resinous components in addition to oil may be present. By contrast, the majority of the other pictures examined have been shown to contain substantial amounts of resin as part of the paint medium, and we conclude that this is a consistent feature of Reynolds's general technical practice.

Mastic was identified in paint in samples from several of the pictures. Since this was often a major component of the varnishes present over the surface, however, it was sometimes difficult to confirm definitively that mastic was a constituent of the paint itself. Even so, strong evidence exists in the case of six paintings to support

the contention that a proportion of this resin was included in the paint. In the late paintings – for example, *Colonel Tarleton*, *Lord Heathfield* and *Mrs Jane Braddyll* – it is very likely the inclusion of resin in substantial amounts that has had a role in producing the most pronounced drying defects and cracking we now see on the pictures. Mastic components were also detected in brown paint from the landscape in *Miss Jane Bowles*, and in small amounts in *The Duke of Queensberry* and *Lady Elizabeth Seymour-Conway*.

Mastic may have been added to the paint medium in the form of varnish, but Reynolds also mentions magilp (megilp) on several occasions. The detection by GC–MS of the marker compounds for mastic unfortunately does not provide any indication of precisely how the medium was actually constituted. It is possible that a pre-prepared gelled or thixotropic medium containing mastic and a drying oil treated with a lead compound was used, which is the formulation known in the eighteenth century as ‘magilp’, ‘megilp’, ‘magylph’ and other terms. This gelled medium, its origins, constitution and behaviour, has been discussed in an earlier description of Reynolds's practice, specifically in relation to *Lord Heathfield* (FIG. 29).⁸¹

Reynolds also mentions his use of copaiba balsam, a type of soft resin produced by a group of trees from the Leguminosae family that grows in South America.⁸² Resins of this type can have a very varied composition, and the term ‘copaiba balsam’ is probably used to cover a variety of resins produced by several different species. This makes full identification of this material difficult.⁸³

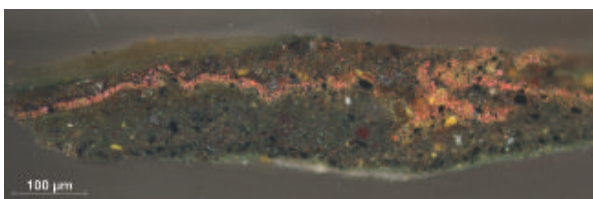


FIG. 27 Joshua Reynolds, *Captain Robert Orme* (CAT. 1), cross-section taken from background.

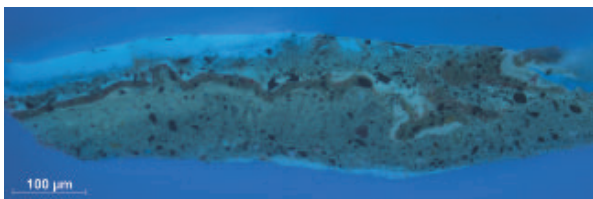


FIG. 28 Joshua Reynolds, *Captain Robert Orme* (FIG. 27), photographed under ultraviolet illumination showing fluorescent interlayer indicating resinous components.

In addition, some of the hard copals, which would have been available in ready prepared varnishes, derive from related Leguminosae species and contain similar constituents. In spite of these challenges, analysis has confirmed the presence of resins from this class in Reynolds's paint for nine of the paintings studied here.

Miss Nelly O'Brien displays particularly severe drying defects in localised areas of the foliage of the background, where the paint has dried poorly and developed wide cracks in the upper glaze-like layers, with still mobile paint from the underlayers exuding through the cracks onto the surface (FIG. 30). GC–MS analysis gave clear indications that a type of copaiba balsam, characterised by the presence of a kaurane component, was contained in the paint.

A similar type of resin was identified in five other pictures: *Miss Jane Bowles*, *Mrs Elizabeth Carnac*, *Saint John the Baptist*, *Mrs Mary Nesbitt* and *Frances, Countess of Lincoln*. The stable marker compounds, methylated eperuic acid and sometimes dimethyl pinifolic acid, were detected, which, despite the small quantities, strongly point to the presence of a Leguminosae resin. In the case of *Mrs Carnac* it seems that a second Leguminosae resin was also present, and that a different paint medium was used for particular brushstrokes applied at a late stage of execution.

Yet another variety of resin, also from a Leguminosae source, was identified in three paintings. Small quantities of methylated copalic acid were observed in samples from *The Duke of Queensberry*, *Mrs Mary Robinson* and *Colonel Tarleton*. This may indicate that a



FIG. 29 Joshua Reynolds, *Lord Heathfield of Gibraltar* (CAT. 15), detail. The medium of the dark blackish-red glaze on the sitter's cuff contains heat-bodied linseed oil with mastic and some pine resin, possibly in a megilp-type formulation.



FIG. 30 Joshua Reynolds, *Miss Nelly O'Brien* (CAT. 4), photomicrograph showing underlying yellow paint emerging through cracks.

different type of copaiba balsam was used in the medium of these pictures, or alternatively this could suggest the use of a copal type varnish. In the case of *Mrs Robinson* it seems likely that this material is associated with a final glaze in keeping with some earlier results.⁸⁴

Formal positive identification of the source of each of these resins has not been possible, but the analyses have shown that resins of the soft copaiba balsam type and, possibly, hard copal resins from the same family were used by Reynolds in the paint medium of these paintings. In each case the relevant components were not detected in the samples of varnish, which strengthens considerably the argument that these materials were present in the original layers and are not related to any subsequent treatment. Although it is known that copaiba balsams were used in older 'restoration' processes such as the procedure known as the 'Pettenkofer treatment',⁸⁵ no record has emerged of this type of procedure having been carried out on any of the paintings examined here and the treatment seems to have been less common in England than in Germany. For the most part, the characteristic components were identified only in certain of the paint samples from each picture, rather than uniformly in every sample analysed by GC-MS. This observation further supports the conclusion that these materials are related to the paint medium used in specific passages, and are not linked to any later overall treatment.

In spite of the mention of Venice turpentine in Reynolds's ledgers, no larch resin was identified by GC-MS in any of the paintings studied here. Additionally, with the exception of a single note that describes using Venice turpentine as a varnish, it is always listed in connection with wax. Since wax was not identified as a major component of the paint in these particular

pictures, the absence of Venice turpentine is perhaps not surprising. Furthermore, it is worth noting that the term 'Venice turpentine' may have been used to signify turpentine of high quality rather than resin from a particular botanical source and that the name did not necessarily specify the resinous balsam of larch species as is understood today. Eighteenth-century Venice turpentine may in fact have contained resins from a variety of conifer species and could have included pine or fir resin, or adulterated mixtures.⁸⁶

Although pine resin was not specifically mentioned by Reynolds, it has been identified frequently in his pictures analysed here, often in combination with mastic resin or sometimes with copaiba balsam. As mentioned above, it is possible that pine resin is present as an adulterant or additive in the other resins, but in some samples it was detected on its own. In the case of *Mrs Jane Braddyll* the panel was prepared for painting by applying thin layers of varnish containing pine resin and heat-bodied linseed oil, so it seems very likely that pine-resin varnish was used by the Reynolds studio.

Varnish

William Mason noted that the portrait of Lord Holderness, mentioned earlier, for which he was present during the sittings, was highly varnished before it was sent to him.⁸⁷ In his 'Sitter Books' Reynolds sometimes notes that a painting required varnishing,⁸⁸ tantalisingly, in Mason's account of Reynolds's technique the section that was to deal with varnishes was lost before it was published.⁸⁹

The 'Technical Notes' seem to show that Reynolds used a range of materials for varnishes, and that often distinct elements of the same painting were varnished differently. However, the material used for the varnish was not always specified or recorded. In the back of the 1766 'Sitter Book' Reynolds noted using an oil varnish over drapery, but using a wax varnish over the head in the portrait.⁹⁰ The earliest mention of a varnish in Reynolds's 'Technical Notes' is an oil-resin varnish made with 'Gum Mast[ic] dissolved in Oil with Sal Saturni [sugar of lead] & Black & Rock Alum'.⁹¹ This mixture would almost certainly have been very thick and viscous. Megilp is recorded as a varnish in a single entry,⁹² and on a few occasions Reynolds recorded varnishing with egg.⁹³ As noted above, he also used a

varnish made of wax in Venice turpentine. Additionally, Reynolds seems to have bought ready-made varnishes, as he refers in his 'Technical Notes' to '*vernicio di Brim*', identified by Benjamin Haydon as a varnish from Birmingham.⁹⁴ For *Mrs Richard Paul Jodrell* (Detroit Institute of Arts, 77.7) Reynolds may also have used a proprietary product recorded as '*varn. con Wolf*', which Haydon reports to be 'Mr Wolff's varnish' – perhaps also the same as that recorded as 'Wolf's varnish' in an inscription by Reynolds on the *Studio Experiments in Colour and Media* (Royal Academy of Arts, London, 03/576).⁹⁵

The 'Technical Notes' indicate that Reynolds may well have added pigments to his varnish on occasion, but this seems to be differentiated from the common technique in his work in which glaze-like paints using varnish, or varnish and oil mixtures, as a medium were employed for specific passages of painting. This is evident, for example, in the portrait of Mrs Nesbitt, where the background has been glazed with a medium-rich paint containing red and yellow pigments. In the case of *Sir John Cust* (National Trust, Belton House), Reynolds records applying a varnish to the whole painting, without oil or megilp, but with the addition of dried pigments.⁹⁶

Reynolds's palette

Reynolds never seems to have become completely settled in his use of pigments and continued to experiment with new combinations throughout his career. It appears that he was always ready to try a new colour, not always with successful results. Edmond Malone noted that Reynolds had stated: 'I tried every effect of colour, and by leaving out every colour in its turn, showed every colour that I could do without it. As I alternately left out every colour, I tried every new colour; and often, as is well known, failed.'⁹⁷

Reynolds's highly varied technique, which, as we have seen, was based on an unusually elaborate layering and paint constitution, particularly in medium, for which paint thickness, opacity and transparency were some of the key manipulable qualities, suggests that it is not strictly meaningful to try to define a typical range of pigments or palette at any stage of his career. There are pigments that were used throughout his painting practice, and these were very largely the staples of the period, all of them (with the exceptions of patent or Turner's yellow and a rare case of Indian yellow) listed

in the first edition of Robert Dossie's handbook.⁹⁸ For the seventeen pictures studied here, remembering that they were painted over a broad period of time, these can be listed as: vermilion, red earths, red lakes from cochineal (probably largely carmines⁹⁹), natural ultramarine, Prussian blue, smalt, orpiment, Naples yellow (probably with variation in precise composition), yellow ochres, yellow and yellow-brown lakes, orange and brown ochres, Cologne earth types, asphaltum (bitumen), lead white, bone black and several vegetable black pigments including charcoal. A single occurrence of what is very likely patent yellow is noted below, and, of course, could be more widespread in his work, although it was probably only available from the early 1770s.¹⁰⁰

Northcote reported that Reynolds was always willing to pay high prices for his pigments as long as they were genuine.¹⁰¹ However, the colourmen did not always prove to be reliable and the blue pigment used to paint the background in the portrait of Admiral Barrington (Royal Museums Greenwich, BMC 2534; FIG. 32), although procured as a specimen of ultramarine, turned out to be blue verditer and turned green within a year, necessitating repainting the sky.¹⁰²

It has been noted in a number of pictures by Reynolds examined here that, in addition to some regularly used specific pigments, there occurs a consistent use of certain pigment mixtures. Most frequent are combinations of vermilion and black incorporating proportions of red earth (often crystalline types such as ground haematite) and usually a little white, probably corresponding to the eighteenth-century colour mixture described in the contemporary literature as '*murrey*'.¹⁰³ This mixture of materials is particularly common in underlayers and presumably arises from Reynolds working up a composition in intermediate warm dark mauvish-brown tones, the paint layers of which are then covered with further colour to achieve a final effect. There are many examples of this method, including in the underpaints of *Mrs Mary Nesbitt* (FIG. 31), *Lady Elizabeth Seymour-Conway, Frances, Countess of Lincoln*, *Mrs Jane Braddyll*, *Colonel Tarleton* and *Lord Heathfield*.

Red

During much of his career Reynolds used lake pigments in his flesh paints. These pigments often faded within a relatively short space of time and the effect was well known, and commented upon, within Reynolds's

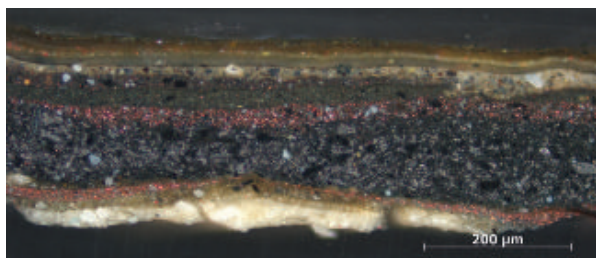


FIG. 31 Joshua Reynolds, *Mrs Mary Nesbitt* (CAT. 10), cross-section from dark area of background, showing multiple layers including 'murrey' colouring.

lifetime.¹⁰⁴ Later in his career Reynolds responded by changing his technique to overcome this fault – his paintings from the mid-1770s onwards are not generally affected to the same degree by fading in the reds and pink colours. It is interesting to note that vermilion is frequently mentioned in Reynolds's 'Technical Notes' (28 times for vermilion; while carmine, which is often blamed for fading, is only mentioned four times, and two of these records refer to a combination with vermilion), which seems to indicate that he was experimenting with more permanent colours to produce his flesh tones. Northcote also commented that, later on, Reynolds used vermilion.¹⁰⁵ The contemporary general public perception that his pictures faded was clearly of some concern to Reynolds. William Thomas Whitley quotes an article from the *Public Advertiser* of 1781 in which a report, probably communicated by Reynolds's studio, or perhaps even the artist himself, states that Reynolds had modified his technique to stop his paintings fading: 'by better ascertaining the proportions of vehicle and colour and by more happily adjusting the qualities of his vegetable and mineral red, increasing the vermilion and decreasing the carmine'.¹⁰⁶

The results of examination of the flesh paints, where analysis has been possible, seems to support this observation, with the earlier pictures noted as being more prone to loss of colour. Faded pictures, such as *The Countess of Albemarle* (FIG. 33) and *The Duke of Queensberry*, use red lake to provide the pink tonality of the flesh, and liberally for the draperies. High performance liquid chromatography (HPLC) analysis of the red lake from the robes in *The Duke of Queensberry*, the curtain in *The Countess of Albemarle* and the pink skirt in *Miss Nelly O'Brien* has identified dye components derived from cochineal (*Dactylopius coccus* Costa) as the colouring matter in each case. In later, less faded portraits, such as *Mrs Susanna Hoare and Child* and *Lady Cockburn and her Three Eldest Sons* (FIG. 34), Reynolds employed

vermilion in combination with red earths in place of carmine. However, the use of red lake is not entirely restricted to the earlier paintings and Reynolds continued with red lakes in paint mixtures throughout his career. A cochineal carmine lake has been identified in the dark shadows of the drapery and the darkened sky in the portrait of Lord Heathfield.¹⁰⁷

Blue

Mason noted Reynolds's occasional purchase of large quantities of ultramarine, as well as smalt.¹⁰⁸ In his 'Technical Notes' Reynolds most frequently mentions ultramarine, but he also records using Prussian blue, which he calls 'Turchino', and which is used extensively throughout his paintings. It has been identified in the blue backgrounds in the portraits of Mrs Nesbitt and the two sisters Frances (Countess of Lincoln) and Elizabeth (Lady Seymour-Conway), and in dark mixtures for shadows as well as in combination with yellows, as, for example, in the backgrounds of *Miss Nelly O'Brien* and *Mrs Susanna Hoare and Child*. In addition to Prussian blue, our technical analyses have identified ultramarine as well as smalt. All three pigments are present in the



FIG. 32 Joshua Reynolds, *Admiral the Honourable Samuel Barrington*, 1779. Canvas, 1779, 76 × 63.5 cm. Royal Museums Greenwich, London, Inv. BHC2534.

sky of *Mrs Hoare*, for example, where a mixture of smalt and ultramarine was used in the opaque layers, while Prussian blue was employed for the final 'glazes'. *Lady Cockburn and her Three Eldest Sons* makes use of ultramarine in the sky, and both ultramarine and Prussian blue in the plumage of the macaw. One common feature noted in this group of paintings is that small amounts of blue pigment have been added to the pale paints of the draperies: smalt in *Mrs Mary Robinson*, *The Strawberry Girl* and *Miss Jane Bowles*, and both smalt and ultramarine in *Mrs Hoare*.

Yellow

A range of pigments are used by Reynolds in his opaque yellow paints, such as the strongly coloured yellow ochre layers seen in samples from the backgrounds of *Miss Nelly O'Brien* and *Lord Heathfield*, as well as in more transparent glaze layers and thin scumbles.¹⁰⁹

In his 'Technical Notes' Reynolds refers to yellow lake and a yellow pigment described as 'Yeos yellow'.¹¹⁰ In *The Duke of Queensberry* a pigment of translucent brown appearance was identified in cross-section. Scanning electron microscopy with energy-dispersive X-ray ana-

lysis (SEM–EDX) indicated that the pigment contained aluminium and is most likely a yellow lake on an alumina substrate. Similar materials occur in *Colonel Tarleton* and in *The Strawberry Girl*.

Earlier, in the seventeenth century, yellow lakes were generally made with a calcium containing substrate, but yellow lakes on alumina substrates were also being produced by this date. A class of yellow dyestuff-based pigments known as 'pinks' could be prepared in this way from a variety of different plant dyestuffs and gave browner colours than yellow lakes prepared on a traditional chalk substrate.¹¹¹

The unusual manufactured pigment known as 'patent yellow' (also 'Turner's Yellow' after its inventor James Turner) was identified in a sample taken from the foreground in *Mrs Mary Robinson*. This pale yellow opaque pigment has the approximate composition $\text{PbCl}_2 \cdot 5\text{-}7\text{PbO}$. Identification was by a combination of SEM–EDX and Raman microscopy on a cross-section using a reference standard for comparison.¹¹²

Reynolds was a regular user of orpiment. It occurs extensively in the golden-brown drapery in the portrait of Lady Cockburn, and the fabric and flag that surround the figure of Colonel Tarleton, as well as in the gold highlights on his uniform. Orpiment has also been identified



FIG. 33 Joshua Reynolds, *Anne, 2nd Countess of Albemarle*, detail showing faded flesh paint of the face.

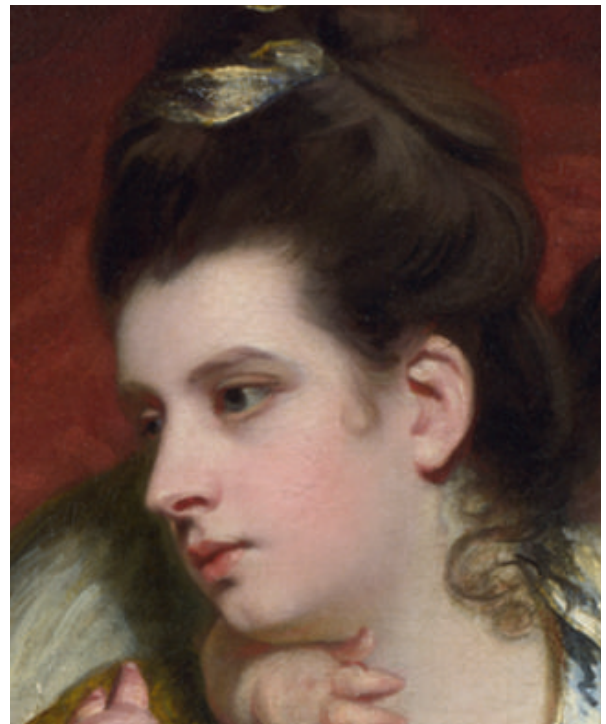


FIG. 34 Joshua Reynolds, *Lady Cockburn and her Eldest Three Sons* (CAT. 7), detail of face where the paint is relatively unfaded.

in a mixed underlayer beneath the foliage background of *Miss Nelly O'Brien* and in a scumbled layer over the flesh paint in *Mrs Mary Nesbitt*.

In an earlier reported analysis of *Lord Heathfield* a thick surface glaze layer was found to contain an opaque lead-tin-antimony yellow pigment in the sitter's waistcoat. A similar mixed oxide lead-tin-antimony yellow was also found to be present in the upper layer of flesh paint on the arm in *The Countess of Albemarle*.¹¹³ This is a variant constitution, or precursor, of true Naples yellow (lead antimonate) which seems to have had application in painting from the seventeenth century, and perhaps before.¹¹⁴ Reynolds may not have known that he was purchasing this particular pigment instead of the more common Naples yellow (he refers only to Naples yellow in the 'Technical Notes', for example) since both pigment types have been identified in his paintings. In association with a brightly coloured yellow earth, Naples yellow was used for the flowers on Mrs Hoare's skirt, and the pure lead antimonate pigment was also identified in the mixed paint layers of the background. A small amount of Naples yellow has also been detected in combination with other pigments in a paint layer beneath the skirt in *The Strawberry Girl*.

Analysis by Rica Jones and Joyce Townsend of *The Age of Innocence* (Tate, N00307) found that certain of the lower paint layers contain the rare pigment Indian yellow.¹¹⁵ The pigment can be identified in cross-sections by a characteristic strong fluorescence under the microscope in ultraviolet illumination. It has an acid yellow colour, and a fine needle-like particle form. Reynolds may have procured this pigment from the artist Charles Smith who was in India in 1784 and to whom Reynolds wrote thanking him for sending a sample of a yellow pigment.¹¹⁶ Indian yellow has not been identified on any other painting by Reynolds and so it seems probable that this was its source.¹¹⁷

Bituminous materials

Asphaltum is mentioned in Reynolds's 'Technical Notes' nine times, with all the entries occurring in the years 1774–6. It normally appears in lists with other more conventional pigments, and some of these notes specify that this substance was used for finishing or glazing pictures. GC–MS analysis of a sample from the shadow of the red curtain in *Lady Cockburn and her Three Eldest*

Sons (see CAT. 7), which dates from 1773, has shown the presence of some bitumen.¹¹⁸ Reynolds's reputation for the exclusive use of this highly troublesome material may not be as well-founded in his actual practice as some commentators, such as Mansfield Kirby Talley Jr, have assumed.¹¹⁹

White

White is listed numerous times in Reynolds's 'Technical Notes',¹²⁰ and on one occasion 'whiting' is listed in connection to the use of gum tragacanth ('gum dragona'). Mason recorded 'flake white' (lead white) as one of the colours on Reynolds's palette when he observed him painting,¹²¹ and lead white has been identified in all the paintings examined. The white paint Reynolds used was commonly applied in a thick and textured way. In *Lady Elizabeth Seymour-Conway* and *Mrs Jane Braddyll* starch was identified in the white paint of the draperies, presumably added as an extender to modify the handling properties. In *Mrs Mary Nesbitt* starch was identified in the flesh paint. Starch was also found to be present in the white paint of the sky in *Mrs Elizabeth Carnac* and in an underlying grey paint layer in the background of *Saint John the Baptist*.

Black

According to Northcote, Reynolds recorded both black and blue-black for flesh painting in a 'Technical Note' from 1755.¹²² Mason, in his anecdotes describing Reynolds's technique, states that blue-black is a form of charcoal.¹²³ Analysis has found both bone black and charcoal in Reynolds's paintings, sometimes in combination, such as in the backgrounds of *Captain Robert Orme* and *Mrs Mary Robinson*.

