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FRONT COVER
Titian, *Diana and Actaeon* (NG 6611; NGS 2839), 1556–9 (detail).

TITLE PAGE
TOP LEFT: Titian, *The Vendramin Family, venerating a Relic of the True Cross* (NG 4452), 1540–5 (detail).
TOP RIGHT: Titian, *Diana and Actaeon* (NG 6611; NGS 2839), 1556–9 (detail).
BOTTOM LEFT: Titian, *The Death of Actaeon* (NG 6420), *c.*1559–76 (detail).
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Titian after 1540: Technique and Style in his Later Works

JILL DUNKERTON and MARIKA SPRING, with contributions from RACHEL BILLINGE, HELEN HOWARD, GABRIELLA MACARO, RACHEL MORRISON, DAVID PEGGIE, ASHOK ROY, LESLEY STEVENSON and NELLY VON ADERKAS

The first of the two volumes of the *National Gallery Technical Bulletin* dedicated to Titian, volume 34 published in 2013, covered all the paintings from before about 1540 that are associated with him in the National Gallery collection, together with four works belonging to other collections that also date from the first half of his career. This second volume, which follows the same format, continues with eight canvases ranging in date from the early 1540s to possibly Titian's last days before his death on 27 August 1576. They include the two *poesie* sent in 1559 to Philip of Spain, *Diana and Actaeon* and *Diana and Callisto* (CATS 4 and 5), acquired jointly by the National Gallery and the National Galleries of Scotland in 2009 and 2012 respectively. The study of these two paintings has depended to a considerable extent on paint cross-sections made during the cleaning of the paintings in the conservation studios of the National Galleries of Scotland in 1998–9. Investigation of the six National Gallery paintings has also been based on re-examination of existing samples, taken either when they were undergoing conservation treatments, often many decades ago, or during preparation of *Venice 1540–1600*, volume II of *The Sixteenth Century Italian Paintings* in the series of *National Gallery Catalogues*.[1] This catalogue, by Nicholas Penny, has provided the basis for the brief historical introductions to each of the paintings.

Since the publication of that catalogue in 2008, further investigations have been made, including the examination of all eight paintings by digital infrared reflectography using an OSIRIS camera with an indium gallium arsenide (InGaAs) line scan sensor. As well as revealing underdrawings for some of the paintings, infrared examination has assisted significantly in the interpretation of their X-radiographs, some of the latter having been published on many previous occasions. A few additional samples have been taken, usually from the very edges of the paintings, in order to carry out medium analysis by gas chromatography–mass spectrometry (GC–MS) or for the identification of dyestuffs in red lake pigments by high performance liquid chromatography (HPLC). The materials and layer structure of both existing cross-sections and some new ones prepared during this study have been examined using optical microscopy in both visible and ultraviolet light, supplemented by energy-dispersive X-ray analysis in the scanning electron microscope (SEM–EDX), transmission FTIR analysis and attenuated total reflectance–Fourier transform infrared microspectroscopic imaging (ATR–FTIR).

New patrons and new ways of painting

In the first half of his career Titian had worked mainly for institutional and private clients in Venice and the courts of north-east Italy. In the 1540s, when he was well into middle age, his professional and social ambition, together with his reputation as a painter, initiated a remarkable widening of his range of patrons that was to include the most important figures of Christendom and their families.[2] He had already encountered the Holy

FIG. 1 Titian, *Charles V at the Battle of Mühlberg*, 1548. Oil on canvas, 335 × 283 cm. Madrid, Museo Nacional del Prado, Inv. P00410.

Roman Emperor, Charles V (FIG. 1), in 1529 and his early production for the Habsburgs centred on his expertise as a portraitist. In 1533 Titian was honoured by the Emperor, who tried to persuade him to come to Spain. He eventually joined Charles V in Augsburg in 1548 and again in 1550–1. Meanwhile he was also cultivating the patronage of Pope Paul III and his Farnese family (FIG. 2). He first met the Pope, also the patron of Michelangelo, at Bologna in 1543, which led to a spell in Rome in 1545–6, the only documented occasion on which he visited that city. Venice remained his base between these travels, and permanently so following his return from Augsburg. While in Augsburg he discussed with the young Crown Prince (FIG. 3), later to become Philip II of Spain, the series of paintings that have come to be known as the *poesie*, two of which, *Diana and Actaeon* and *Diana and Callisto*, are included in this study (CATS 4 and 5). The subject of another, *Venus and Adonis* (Museo Nacional del Prado, Madrid, Inv. P00422), is represented here by a workshop version in the National Gallery collection (CAT. 3). In addition, *The Death of Actaeon* (CAT. 8) may have been begun for Philip as part of this series but was never sent to him. Most of Titian's later production was for the Spanish King, and included complex allegories and religious subjects, among them *The Tribute Money* (CAT. 6), dispatched to Madrid in 1568.

Although Titian undertook fewer official assignments from the Venetian state – and tended to delegate much of their execution to members of his workshop when he did accept such work – he still undertook major commissions from certain patrician families in the city, among them the Vendramin, for whom he painted the large canvas showing the male members of the family venerating a relic of the True Cross, to which they had a particular devotion (CAT. 1). It is also possible that the painting known as *An Allegory of Prudence* (CAT. 2) once formed part of the decoration of their family palace. The early provenance of the intimate devotional canvas *The Virgin suckling the Infant Christ* (CAT. 7) is unknown; Titian could have painted it for an Italian patron or friend, or indeed even for himself.

The paintings in the catalogue are organised in approximately chronological order, but in many instances opinions vary widely as to the likely dates of their inception and completion. As will be demonstrated, Titian's materials in the second half of his career remained essentially the same as before, although with some adjustments and extensions to his palette as a result of the introduction of new pigments. However, the ways in which he manipulated those materials underwent a considerable change, particularly in the last years, with the development of his much discussed 'late style'.

FIG. 2 Titian, *Pope Paul III and his Grandsons*, 1545–6 (unfinished). Oil on canvas, 210 × 174 cm. Naples, Museo Nazionale de Capodimonte, Inv. 129.

FIG. 3 Titian, *Portrait of Philip II seated* (unfinished), *c.*1550–6. Oil on canvas, 108.7 × 94.5 cm. Cincinnati Art Museum, Inv. 27.402.

Painting supports

In contrast with the first twenty or so years of Titian's output, very few later paintings are on panel supports – not even altarpieces that were destined to remain in Venice. One exception is the signed altarpiece for the parish church of Santa Maria Nuova in Venice, which shows *Saint Jerome in the Desert*. It is generally agreed that the work dates from the mid 1550s, around the time that Titian was painting the 'Diana *poesie*' with which it has elements in common, especially the dense foliage and the rocky bank of *Diana and Callisto*. In 1540–2 Titian had also painted another altarpiece on panel, *The Crowning of Thorns* (Musée du Louvre, Paris, Inv. 748), but the use of this support may have been at the specific request of the Milanese confraternity who commissioned it. Very probably while he was in Rome in 1545–6 he painted an *Ecce Homo* for Charles V, which is on a slate support (FIG. 4), presumably in emulation of paintings on slate to be seen there by his old Venetian colleague, Sebastiano del Piombo. The dark surface of slate, however, may not have suited Titian's approach, which was to build up colour from a light base, and when he added a pendant *Mater Dolorosa* for the Emperor, referred to in a letter of June 1553, he chose to paint it on a wooden panel (FIG. 5). The painting has a radiant luminosity that poorly matches the darker work on slate. This may be one of the reasons why, in 1554, Charles V commissioned a second *Mater Dolorosa* (Museo Nacional del Prado, Madrid, Inv. P00444), this time with her hands apart, following the iconographic model of a Netherlandish painting sent to Titian from Brussels.[3] Charles also requested that it be painted on stone. Instead of slate, however, Titian used the lighter coloured marble. These works of the mid 1550s are the last known paintings on supports other than canvas.[4]

FIG. 4 Titian, *Ecce Homo*, 1547. Oil on slate, 69 × 56 cm. Madrid, Museo Nacional del Prado, Inv. P00437.

FIG. 5 Titian, *Mater Dolorosa with Hands clasped*, 1554. Oil on panel, 68 × 51 cm. Madrid, Museo Nacional del Prado, Inv. P00443.

Of the paintings included in this study the majority are on canvases with a plain or tabby weave. This seems also to be the case with Titian's later output in general. The weaves vary in their thread counts, the finest being that of *Diana and Callisto* (CAT. 5), although this is nowhere near as fine as the canvases that Titian used when executing paintings in Augsburg. Even the enormous canvas of *Charles V at the Battle of Mühlberg* (FIG. 1), for example, was painted on a canvas woven with 25 threads per centimetre, finer indeed than the unusually fine canvas that had been supplied to Titian back in the 1520s for *Bacchus and Ariadne*.[5] When in Venice, Titian seems to have continued to prefer rather coarser canvases with irregularities in the thickness of the spun thread that result in more textured areas of

weave, with slubs and raised threads; this texture is often visible in the more thinly painted parts of the canvases (FIGS 6 and 7), although it has no doubt become more prominent since all of the paintings have been lined. To some extent the weight of the canvas chosen may relate to the location and function of the work, so that, for example, *An Allegory of Prudence* (CAT. 2), probably part of a decorative scheme, is on a relatively coarse canvas. There does seem to be a more general tendency, however, for Titian's last works to be on rougher-textured supports and so *The Virgin suckling the Infant Christ* (CAT. 7), despite being a more intimate work presumably intended for contemplation in a more private setting, is on a canvas of similar weave to that of the *Allegory*.

One of the National Gallery paintings, *The Death of Actaeon* (CAT. 8), is painted on a robust twill-weave canvas, also used for some other very late works such as the version of *The Entombment* that can be identified with a painting given by the Venetian Senate to Antonio Pérez, Philip II's chief minister, in 1572 (Museo Nacional del Prado, Madrid, Inv. P00441), and the Vienna *Nymph and Shepherd* (FIG. 60).[6] From the mid to late 1560s there are a couple of works on canvas with a more complex herringbone twill: *Venus blindfolding Cupid* (Galleria Borghese, Rome, Inv. 170) and *Saint Margaret and the Dragon* (Museo Nacional del Prado, Madrid, Inv. P00445). However, Titian does not seem to have employed this type of canvas as often as Tintoretto and Veronese, his main rivals in Venice.[7]

The Vendramin Family (CAT. 1) and *Pope Paul III and his Grandsons* (FIG. 2) are exceptionally painted on damask or point twill canvases with a distinctive lozenge pattern. The two supports may well have been made from the same roll of fabric. Although this type of canvas later came to be known in Spain (where it was particularly used by El Greco) as *mantelillo veneziano*, it does not in fact seem to have been much used in Venice. Most surviving examples from the sixteenth century come from mainland Italy. These canvases were more expensive than plain or more simple twill canvases because of the time that it took to set up the loom, but they had the advantage for large pictures – such as Titian's two family portraits – of being available in double the usual width of approximately a metre of the other types of canvas. Therefore, there are no seams in these two canvases. The National Gallery's version of Titian's successful and much repeated *Venus and Adonis* composition (CAT. 3) is also on a canvas with an unusual complex twill weave, essentially a broad herringbone but incorporating a chevron along its spine, and of wider than normal width. A canvas with the same weave was also used for another painting of similar date, *Saint John the Evangelist on Patmos* (National Gallery of Art, Washington DC, Inv. 1957.14.6), which is thought to have been painted in around 1547.[8] That Titian was aware of the sources of his canvases is suggested by a letter dated 15 October 1564 in which García Hernández, secretary to the Spanish ambassador to Venice, informed Philip II that Titian had eventually agreed to paint a second version of *The Martyrdom of Saint Lawrence* for El Escorial (where it still hangs) on canvas 'from the same loom' ('*en el mismo telar*') as that for the *Last Supper*, recently dispatched to the King and also for El Escorial.[9]

FIG. 6 NG 224, Titian, *The Tribute Money* (CAT. 6), detail showing the canvas texture visible in the Pharisee's neck.

FIG. 7 NG 6420, Titian, *The Death of Actaeon* (CAT. 8), detail showing the canvas weave texture where it is visible in Diana's right hand.

The dimensions of the paintings in this study that were painted on standard-width canvases are such that they could be painted either on a single piece or by joining two lengths of fabric with a single seam. The construction of the canvas of *The Death of Actaeon* (CAT. 8), however, is rather eccentric, with a triangle of damask-weave canvas (possibly recycled) inserted into the upper part of the seam; in the later part of his career, Titian and his workshop seem to have become particularly reluctant to waste canvas. Several paintings are known to have been executed over abandoned compositions and sometimes over completed paintings.[10] A notable example is the very late *Saint Sebastian* in St Petersburg (FIGS 8 and 9), in which X-radiography has revealed that the upper part of the canvas consists of an apparently completed replica of *The Tribute Money* (CAT. 6).[11] This is on the same scale as the National Gallery painting and repeats the design in its final state. It was probably painted by a member of the workshop, either as a record in order to generate further copies or for immediate sale. Presumably, when it failed to find a buyer it was decided to adapt the canvas by adding a strip to the right edge and another piece to make up the lower half – the position of the figure on the canvas does not suggest that the picture began as a half-length and was only later extended. Such parsimony is remarkable given Titian's wealth and success.

FIG. 8 Titian, *Saint Sebastian, c.*1570–5. Oil on canvas, 210 × 115.5 cm. St Petersburg, The State Hermitage Museum, Inv. 191.

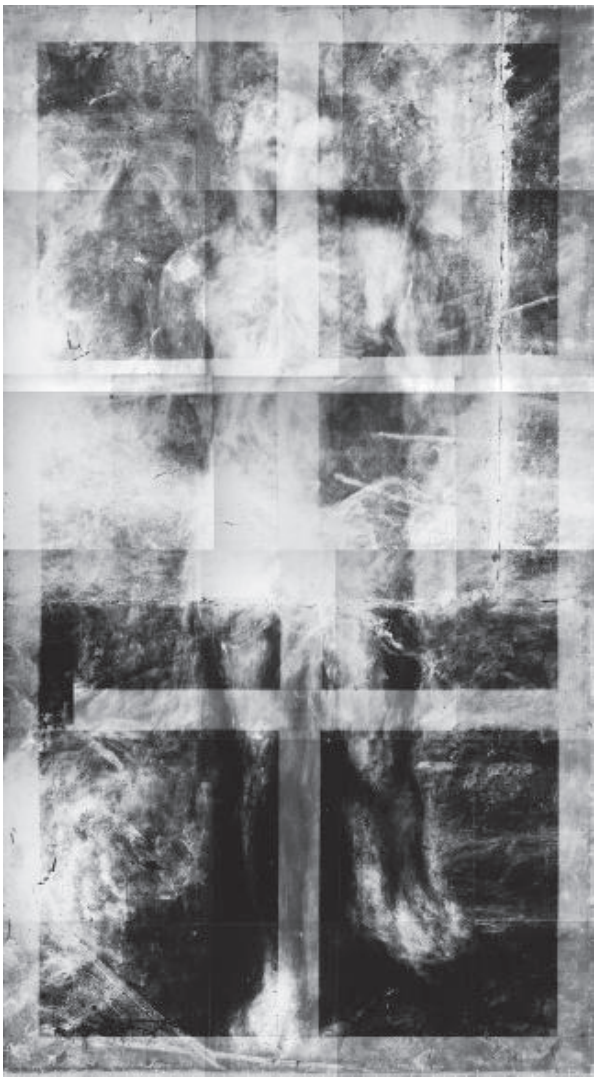

FIG. 9 Titian, *Saint Sebastian* (FIG. 8), X-radiograph.

Preparing to paint

All eight canvases in the study were first prepared with an application of gesso, generally composed of gypsum ($CaSO_4 \cdot 2H_2O$, calcium sulphate dihydrate). Gypsum could be used in its raw mineral form, or roasted to drive off the water, producing anhydrite ($CaSO_4$, anhydrous calcium sulphate), and then slaked in water, which resulted in recrystallisation to give gypsum again, but with finer more uniform particles, known as *gesso sottile*. Titian seems – from the particle characteristics of the gesso seen in samples – to have used slaked gypsum rather than raw, except perhaps in *Diana and Actaeon* where the particles are less regular in size and shape. In two of the paintings some anhydrite was found (CATS 3 and 8),[12] and EDX analysis of samples from three of the paintings (CATS 2, 3 and 7)[13] showed that small amounts of dolomite (calcium magnesium carbonate) and silicaceous minerals are also present, most probably as impurities rather than a deliberate addition. It is relatively common for dolomite to be associated with gypsum, but even so it could indicate that the source was the nearby mountains of north-east Italy that gave this mineral its name. When Titian was working in Augsburg in 1548 and 1550–1 he was happy to use the locally available calcium carbonate (chalk) for his grounds[14] and indeed it would be perfectly possible, although perhaps exceptional, for him to have used such grounds in paintings produced in Venice.[15] In one example, *Diana and Callisto*, particles of starch were identified in the gesso ground, but this may be from lining adhesives or from a starch paste used to apply a protective facing in a past relining.

The preparation of the gesso for Titian's paintings – a task presumably delegated to assistants – does not seem to have been especially consistent, but it would in any case have been less critical than for the paintings on panel of the earlier generation, where a smooth surface was required. The visibility of the canvas weave in many areas of the better preserved works indicates that the gesso layer was applied thinly, perhaps scraped on with a palette knife (see vol. 34 of this *Bulletin*, pp. 11–12), so that it served mainly to fill the depressions in the weave to some extent, but only slightly covered the tops of the threads. In the paint cross-sections a substantial layer of gesso was rarely seen (among the exceptions are those illustrated in CAT. 1, FIG. 66, and CAT. 5, FIG. 153), and was more likely to be present when the sample point coincided with a depression in the weave.

As a general rule, in Titian's later paintings studied at the National Gallery and also in other laboratories, there is no longer an *imprimitura* over the gesso as found in cross-sections from many of the earlier works (see vol. 34 of this *Bulletin*, pp. 13–15) where it was typically an off-white or light grey or occasionally a warmer light beige. The exception among the paintings being considered here is *Diana and Actaeon*, where a pale beige layer composed of lead white with a little red lead and a fine black pigment was brushed over the surface with broad sweeping strokes, which, judging by the X-radiograph, do not completely cover all the gesso beneath.

However complex the build-up of paint layers and however much Titian may have reworked a painting, his starting point seems always to have been a light-coloured painting surface – usually, it would seem, just gesso. The vulnerability of this gesso to damage during past lining and cleaning and its tendency to darken as a result of the absorption of varnish and lining adhesives, means that the appearance of some later works gives the misleading impression that they are painted on brown grounds or primings. This is particularly the case with *Diana and Callisto*, as a result of abrasion and an increase in the transparency of the paint in certain areas, for example in the rocks around Diana's head. Something similar is likely to be the case with the unfinished portrait of Philip of Spain (FIGS 3 and 10). Here the painting of the white and grey of his robe and sleeves never proceeded further than a first rough lay-in of the folds, not even painting them up to the edges of the arm of the throne. The gaps between sleeve and throne now appear brown, in the same way as the abraded and altered areas

FIG. 10 Titian, *Portrait of Philip II seated* (FIG. 3), detail showing the sitter's arm.

of *Diana and Callisto*, but if they were originally whitish gesso, the shape of the sleeve would appear complete, although yet to be covered with paint.

Although in the past it was often believed that Titian worked on brown grounds and was even responsible for their introduction, darker painting surfaces seem rare, if not exceptional, in his production.[16] Indeed, the painters of Venice were surprisingly slow to take up techniques based on coloured and dark primings, when compared with their associates in centres such as Ferrara, Parma and Brescia, who were doing so from as early as the second and third decades of the century. Tintoretto seems to have begun painting on such surfaces only in the late 1550s,[17] as did Jacopo Bassano at much the same time;[18] both were to make considerable use of the advantages of working on dark primings in their later works.

Drawing and underdrawing

The paucity of surviving drawings on paper by Titian that can be associated with specific paintings means that it impossible to establish the extent to which he worked out compositions in advance of laying his brush to canvas or panel. No drawing can be associated with the preparation of any of the works included in this volume,[19] and indeed there are very few drawings from the second half of his career that can in any way be linked with a known painting.[20] A rare exception is the study for the legs of the torturer in the lower right corner of *The Martyrdom of Saint Lawrence* (FIGS 11 and 12), which Titian painted for the Church of Santa Maria dei Crociferi, Venice, and which is now in the Church of the Gesuiti. This was probably commissioned, although not necessarily begun, in 1547, before Titian's departure for

FIG. 11 Titian, *The Martyrdom of Saint Lawrence*, *c.*1548–57. Oil on canvas (transferred to another canvas), 493 × 277 cm. Venice, Church of Santa Maria Assunta dei Gesuiti.

FIG. 12 Titian, *Study for The Martyrdom of Saint Lawrence*, black chalk or charcoal on blue paper, 40.9 × 25.2 cm. Florence, Galleria degli Uffizi, Gabinetto dei disegni e delle stampe, Inv. 12907.

Augsburg, and in early 1557 it is recorded that it was still not quite finished.[21] The upper part of the drawing shows that the torso and arms of the figure are faintly outlined, suggesting that either they were taken from a previous drawing or that this part of the figure was already established in the painting and that the study of the musculature was only made when Titian realised that he needed to consider this aspect of the work in greater detail. Even in this study, however, the handling of the soft black chalk, or perhaps charcoal, is broad and impressionistic, supplying just enough information to guide the execution of the legs in paint.[22] Typically, the feet and toes, lost in semi-darkness in the painting, are only roughly indicated. On the *verso* there is another study of a leg (together with other sketches, not all of which are by Titian), this time for the *Sisyphus* in the Museo Nacional del Prado, Madrid (Inv. P00426). This confirms that such studies were part of Titian's practice, and he must have made similar drawings, now lost, before and during the execution of some of the National Gallery paintings, and perhaps especially when he was making revisions to them.

The outlining of forms with a brush and fluid black paint, and without any shading, was part of Titian's usual underdrawing practice throughout his career. In the underdrawing for the two main figures in *The Vendramin Family*, for example, executed directly on the gesso ground, there are free and approximate lines, with rapid flourishes and curves, to suggest roughly the position of a figure or the folds of a drapery. The legs of the figure here identified as Gabriel Vendramin were also drawn (FIG. 13), and although there are numerous alterations to the composition, it seems unlikely that it was ever Titian's intention to show them. In the finished painting they are hidden by the expansive cloak. Their position, however, is important for the establishment of the figure's pose on the rising steps.

Often the thickness of the overlying paint layers, as well as other factors such as the composition of pigment mixtures, makes it difficult to detect all of the first sketched lines of underdrawing by infrared imaging. Nevertheless, enough can be seen to make it clear that it was usual for Titian to begin a work with some form of underdrawing, even in his last years: for example, *The Tribute Money* (CAT. 6) shows a careful outlining of the Pharisee's hand and arm holding the coin, albeit not followed in the painting, together with some less precise lines to indicate the folds of Christ's drapery (FIG. 14). Therefore, the Pharisee's drapery must surely also have

FIG. 13 NG 4452, Titian, *The Vendramin Family, venerating a Relic of the True Cross* (CAT. 1), detail of the infrared reflectogram.

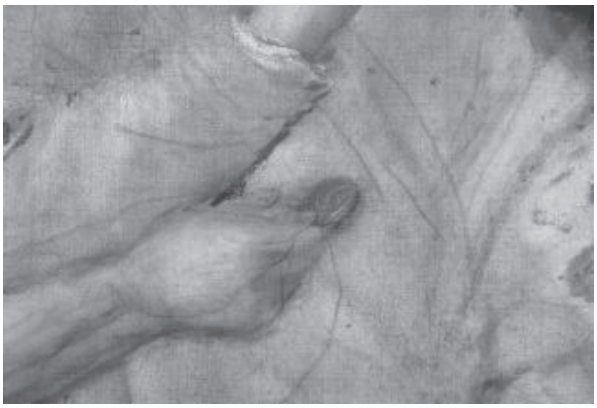

FIG. 14 NG 224, Titian, *The Tribute Money* (CAT. 6), detail of the infrared reflectogram.

been underdrawn, even if it cannot be seen in the infrared image, and is probably hidden by the paint.

Not all the dark lines of drawing visible in infrared reflectograms of paintings by Titian are part of the first drawing-out of the design on the gesso. In both early (see, for example, *Noli me Tangere*, CAT. 7, p. 66, in vol. 34 of this *Bulletin*) and late works, lines of black paint similar in character to those in the underdrawings occur well up in the paint layer structure, usually where there has been a revision to the composition: for example, the lines for the figure of Lunardo, the eldest Vendramin son, who was moved further into the painting (see CAT. 1). Among other paintings that show 'drawing' that is actually between paint layers are *An Allegory of Prudence* (CAT. 2) and *The Death of Actaeon* (CAT. 8).

With the exception of *Venus and Adonis* (CAT. 3) and possibly in a very general way *The Virgin suckling the Infant Christ* (CAT. 7), all the paintings in this study are new inventions in their subject and composition. Consequently, all the underdrawing that can be detected appears to be freehand and part of the creative process. However, much of the production of Titian's workshop was based on replicas and derivations of existing designs. It seems to have become the practice in the workshop from as early as the 1530s (see vol. 34 of this *Bulletin*, pp. 17 and 86), and possibly even before then, to make tracings of successful new designs that could then be used wholly or in part to generate new works. The copy of *The Tribute Money* that now forms part of the canvas for *Saint Sebastian* (see FIG. 9) may have been painted in the workshop before the original was sent to Spain, but equally it could have been produced afterwards and have been based on a tracing, as must have been the case with the Vienna variation (see FIG. 154) of *Diana and Callisto* (CAT. 5), which it replicates closely in its underdrawing, even though the final painting is notably different.[23]

It has been possible to demonstrate the use of some form of mechanical transfer, almost certainly in the form of tracings, across the long sequences of replicas and variations of Titian's most successful and repeated designs, notably that of the subject of the reclining Venus, shown with an organist in the earlier versions and a lute player in the later ones,[24] and the paintings, sometimes paired, of *Danaë* and *Venus and Adonis*.[25] In many cases the basic design of the main figures seems to have been transferred to the canvas and then variations introduced in the course of painting. It is generally agreed that Titian played a part in these adaptations, even when much of the execution of the painting is likely to have been carried out by the members of the workshop. In other examples, such as the National Gallery's *Venus and Adonis* (CAT. 3), the underdrawing (FIG. 15), which seems to have been made by transferring a design by tracing (at least for the main figures), has been followed in the painting stage without any significant divergence and the accomplished yet uninspired execution of the painting has led to general agreement that this is largely a product of the workshop. However, even when an underdrawing has evidently been transferred by tracing, it should not necessarily be assumed that Titian played little part in the production of the painting. The character of the underdrawing of the entire composition of the *Venus and Adonis* now in the Prado (FIG. 106) and the figure of Danaë in the Apsley House version of that subject (FIG. 107) – now demonstrated to have been the first two *poesie* sent by Titian to Philip of Spain – suggests the transfer of full-size cartoons from tracings of previous versions of those subjects.[26] Only in the underdrawing of the old woman, a new introduction to the composition in the Apsley House version, is there any of the broader freehand technique seen in so many paintings by Titian. While Titian must surely have been responsible for most of the painting of these canvases, given the importance of the client, the careful precision of the transferred underdrawings suggests that this was almost certainly a task that he could have confidently assigned to his workshop.

FIG. 15 NG 34, Titian workshop, *Venus and Adonis* (CAT. 3), detail of the infrared reflectogram.

The workshop

Titian's international fame resulted in a considerable increase in the size of his workshop, yet there is relatively little detailed information about the extent of their activity in the production of paintings. If Vasari's stories about Paris Bordone and Jacopo Tintoretto are to be believed, Titian did not tolerate for long the competition of talented young painters, preferring instead to work with long-term associates and family members, including his son Orazio, who assumed managerial responsibilities for the business but who also painted. On the evidence of those works attributed to Orazio, his solid, rather heavy execution indicates little understanding of his father's work. Marco and Cesare Vecellio, the sons of two of Titian's cousins, do not seem to have been any more able, at least in those works that they produced on their own account.[27] Titian maintained his lifelong friendship with Francesco and Valerio Zuccato, sons of his first master, Sebastiano, and like their father known mainly as mosaicists. Girolamo Dente, described in a letter of 1564 as 'a relative or pupil who has been in Titian's house for more than thirty years, and is considered the next best after him',[28] seems to have been a careful and competent painter, especially when following a Titian model, but his works tend to be smooth in finish with none of the dynamism and variety of surface interest of Titian's own painting.[29] Several foreign painters seem also to have been associated with the workshop, many of them probably only there for short periods to widen their experience, although Emanuel Amberger, a German painter, became a member of Titian's household in the 1560s.[30]

It is relatively easy to identify paintings that are repetitions and variants of Titian compositions painted largely by the workshop, sometimes perhaps with minor interventions by Titian himself. These seem to have been acceptable to many patrons, including even Philip II of Spain, on one occasion at least.[31] However, there is less agreement about whether members of the workshop contributed to any great extent to paintings that are considered to be largely autograph. It might be assumed that as Titian's eyesight, particularly his close vision, began to fail with extreme age, he would have made use of specialist painters for the execution of fine detail, but this was not necessarily the case (see p. 97). It is, however, reasonable to suggest that into his late seventies and early eighties he was perhaps not prepared to climb scaffolding to gain access to the highest parts of very tall paintings such as the version of *The Martyrdom of Saint Lawrence*, now in El Escorial, that he sent to Philip in 1567. Moreover, in the case of the paintings assumed to have been among Titian's very last works, the breakdown of a logical order of paint application would have made delegation very difficult, but it has also been suggested that some of these were revised by the workshop after Titian's sudden death in order to make them more saleable.[32] These hypothetical arguments are not, however, based on any particular technical evidence from examination of the paintings.

In conjunction with traditional connoisseurship, we would argue that the scientific examination of paintings can help to resolve certain issues of workshop participation borne out by general patterns of practice. A painting that is a product of the workshop is more likely to have a schematic underdrawing, showing evidence of transfer from cartoons, and to have been painted with few pentimenti and cheaper pigments with, for example, the skies painted with smalt alone and not completed with costly ultramarine. The paint application and layer structures as revealed by cross-sections may be more direct and less complex and multilayered. All these features occur in the National Gallery's version of *Venus and Adonis* (CAT. 3), yet it should be pointed out that many of them also apply to the Prado version (FIG. 106), identified as the one sent to Philip. This version includes ultramarine in the painting of the sky and, given the importance of the patron and the project, it was surely executed by Titian himself.

Pigments and paint medium

In the second half of the sixteenth century Venice continued to be an important centre of the pigment trade with its specialist pigment sellers, the *vendecolori*, dispatching their colours across Europe.[33] In 1561, for instance, Philip II was in touch with Titian about the purchase of pigments for the decoration of El Escorial and in 1572 Titian's son Orazio was reimbursed by the Spanish ambassador in Venice for pigments bought from the *vendecolori* Alvise dalla Scala, who, according to Orazio, supplied pigments at the best price 'which at the time can be found in this city'.[34] The magnificent portrait in Dresden of a man dressed in black velvet robes and with a box of what are clearly dry pigments on the sill (FIGS 16 and 17) has recently been identified as Alvise dalla Scala, the inscription in the lower left corner (made

FIG. 16 Titian, *Portrait of the Colourman Alvise dalla Scala* (*Portrait of a Man with a Palm*), 1561–2. Oil on canvas, 138 × 116 cm. Dresden, Staatliche Kunstsammlungen, Gemäldegalerie, Inv. 172.

FIG. 17 Titian, *Portrait of the Colourman Alvise dalla Scala* (*Portrait of a Man with a Palm*) (FIG. 16), detail showing the box of pigments.

more legible by infrared reflectography) recording Titian's authorship, the date (1561) and that the sitter was aged 56 and a *guardiano* (that is, an officer of a confraternity).[35] In that year Alvise became one of two *decani* (deacons) of the Scuola Grande di San Rocco, of which Titian was intermittently a member, and this would have been an appropriate moment for the commissioning of a portrait. The sitter's evident prosperity demonstrates the importance and success of the pigment trade in Venice.

The developments in the way in which Titian manipulated his paint in works made later in his career – his so-called 'late style' – are accompanied by some notable changes to his palette, although other elements of Titian's technique and many of the materials that he used remained consistent throughout his career. He does not seem to have been particularly pioneering in his choice of pigments, but was instead simply adopting new materials over his long life as they became more widely used by artists in Venice, presumably as they became more readily available through the *vendecolori* of the city. The most significant of the pigments that mark a difference between his early and late work is the blue cobalt glass pigment smalt, which became extremely common in the second half of the sixteenth century, coinciding with the time when Titian began to use it. While smalt has an attractive blue hue resembling that of ultramarine – even if a little less intense – when it is well preserved, it was one of the most unstable pigments on the artist's palette at that time and has almost invariably lost its colour as the paint has aged, especially where it is not mixed with lead white. The degradation process also causes greater yellowing of the oil than would normally occur on ageing, so that smalt-containing areas of paint can become a dull grey or even a deep translucent brown that can resemble degraded varnish or intentionally brown glazes. An example of this effect (more straightforward than in Titian's paintings and therefore more easily recognised) can be seen in the sleeve of the priest in Veronese's *The Consecration of Saint Nicholas* (FIG. 18), where a grey underpaint of discoloured smalt and white is visible between the brushstrokes of the upper layers of modelling, which in the now deep brown shadows are composed of smalt alone, while the well-preserved highlights are ultramarine and white.

The impact of the alteration of smalt on the appearance of Titian's paintings has generally been underestimated, as has its influence on perceptions of the coloristic aspects of his late style and technique, and it is no coincidence that it is in works dating from after he begins to use this pigment that his paintings start to be described as being more subdued in tone, and in the case of *The Death of Actaeon* (CAT. 8) even 'monochrome' by certain commentators.[36] While there may be very real changes in the way in which Titian uses colour later in his career, it is important to disentangle them from the unintended consequences of the discoloration of this pigment.

Comparison of the results from the study of both the early and later works in the National Gallery (see vol. 34

FIG. 18 Paolo Veronese, *The Consecration of Saint Nicholas* (NG 26), 1562. Oil on canvas, 286.5 × 175.3 cm. Detail showing the sleeve of the priest in the foreground, with brown shadows of degraded smalt.

of this *Bulletin*) also shows some differences in the use of materials that would have functioned as additives modifying either the working properties or the drying of the paint. In the earliest paintings, zinc sulphate (zinc vitriol) was found – most probably added as a siccative. If used in excess this can cause paint defects, and it was perhaps responsible to some extent for very marked drying cracks in some of the early works. However, in these and also the later paintings these cracks are most often confined to areas of pentimenti and are therefore more likely to be a result of the superposition of layer after layer on top of paint that was still soft when changes were made to the compositions, so that the paint accumulated to a thickness that could in itself have caused drying problems. An additive present in the paint in the two latest works in the National Gallery, but not in any of the earlier ones, was colourless powdered glass. In *The Death of Actaeon* (CAT. 8) there is a small amount in the purplish red shadows of Diana's dress – together with red lake and smalt, the latter now pale and discoloured. Smalt is also a glass and so is of similar particle shape, but the intentionally colourless glass can be distinguished by its elemental composition, which shows that it is of the soda-ash type made with marine plant ash as a flux.[37] This additive was used extensively by artists from all over Italy as early as the late fifteenth century and onwards, but seems to be present only sporadically in Titian's paintings and does not appear to be part of his or his workshop's habitual practice. Artists seem to have used it mainly in slow-drying paints pigmented with red lakes or black. In *The Virgin suckling the Infant Christ* (CAT. 7) a very small amount of colourless powdered glass was added to the dark paint of the background, which is composed mainly of black pigment with a little earth, and some red lead, this last component also being capable of acting as a siccative. The black paint in the robes of the boys at the left of *The Vendramin Family* (CAT. 1) instead contains a copper drier, probably added in the form of verdigris but now having reacted with the oil so completely that no green particles are visible in samples and it could only be detected by SEM–EDX analysis.[38]

The rate of drying would also depend on which drying oil was used as a binder, and how it was prepared. The results of medium analysis on samples from *The Vendramin Family* (CAT. 1) and *Venus and Adonis* (CAT. 3) were reported as early as the first volume of the *National Gallery Technical Bulletin*.[39] These investigations established firmly that Titian's paint medium was oil, with both linseed oil and walnut oil being identified, although only gas chromatography (GC) was used for the analyses and so it would not have been possible to determine whether the oil had been heat-bodied. Gas chromatography–mass spectrometry (GC–MS), which can provide this additional information, has been used at the National Gallery since 1980, but had not been applied to the later works by Titian in the collection until this current study. New binding medium analyses were carried out for seven of the eight paintings included here.[40] Where possible, a range of samples from different areas were examined, although for some paintings the results obtained were limited to those from only one or two samples. Generally, the pattern established in the 1970s has been confirmed: both linseed oil and walnut oil were identified, and in addition there was evidence that Titian's oil was heat-bodied, at least to some extent, in all the samples that were analysed.[41]

In three of the paintings – *Diana and Actaeon* (CAT. 4), *The Virgin suckling the Infant Christ* (CAT. 7) and *The Death of Actaeon* (CAT. 8) – only linseed oil was found, but while it is probably significant that among these are the two latest works (see below), in *Diana and Actaeon* it is perhaps more likely to reflect the number and locations

of the samples available since it was not possible to sample the light-coloured flesh of Diana or her nymphs, where it might reasonably be expected that Titian would have chosen to use walnut oil. Indeed, in its companion, *Diana and Callisto* (CAT. 5), walnut oil was found in the pale yellow paint of the beam of sunlight in the upper left corner of the sky, while the dark green-brown paint of the foreground seems to be bound with linseed oil.[42] Both linseed and walnut oils were also used in *The Tribute Money* (CAT. 6), the latter detected in the lightest parts of the sky, with linseed oil used in the darker paint of the background. Similarly, both types of oil were found in *Venus and Adonis* (CAT. 3), suggesting that the practice of using different binders for different colours extended to at least some of the workshop copies. In all the samples that were analysed from *The Vendramin Family* walnut oil was identified, but all were from purples, blues and pinks, where it might be expected, including that from the cloak of the boy in the left corner, described as black in the earlier published results, but in fact a deep purple-grey or lavender.[43] The majority of these paintings therefore continue Titian's earlier practice of using the less yellow walnut oil for light-coloured paints or for those colours such as purple and blue that would be badly affected by any discoloration of the medium, and linseed oil in other darker paints. This distinction may have become less important to Titian in his very latest works, however, since linseed oil was used as the binder even in the white clouds in *The Death of Actaeon* and the lilac-coloured dress in *The Virgin suckling the Infant Christ*.

More careful choice of a type of oil that was not yellow or yellowing must have been a particular concern when using the very precious blue pigment natural ultramarine. It was highly valued for its pure intense hue, but the lapis lazuli stone from which it was prepared is rare, and the principal source in Titian's time and well after was the remote mountains of Afghanistan.[44] Venice was one of the main points of entry into Europe for trade from the East, so lapis lazuli would have been more easily available, presumably at a more reasonable price, than elsewhere. Nevertheless, it would still have been by far the most costly material that artists were using,[45] although Titian would not have spared the expense for the works destined for Philip II – ultramarine of exceptional quality is very evident, especially in *The Tribute Money*, *Diana and Actaeon* and *Diana and Callisto*, and also in *The Entombment* (Museo Nacional del Prado, Madrid) delivered to the King at the same time. The grades of ultramarine that had a slightly purplish tinge were particularly prized; some recipes, including one in the *Secreti* of Alessio Piemontese, published in Venice in 1555, suggest that the pigment could be treated with dragonsblood (a red resin) or with a red dye such as brazilwood to improve it.[46] A practice of this kind could be responsible for the very small amount of what seem to be tiny pink particles seen in the ultramarine-containing paint in several of the paintings in this study, two examples being *Diana and Actaeon* (CAT. 4, FIG. 146) and *Diana and Callisto* (CAT. 5, FIG. 181).[47]

The lavish use of ultramarine in skies, landscape and draperies, set against deep translucent red lakes, gives the impression of rich luxuriant colour in the paintings for Philip II (FIG. 19). *The Death of Actaeon* (CAT. 8), which may initially have been intended for the King even if it was never sent to him, seems instead at first to be rather sober in tone, with Cecil Gould remarking in 1972 that Titian had abandoned the 'crimson draperies and ultramarine skies' of his earlier paintings.[48] Although not obvious at first sight, ultramarine has in fact has been used in the sky, but is not mixed with white and is therefore rather deeper in tone than the skies in the *poesie*. It has no doubt also become darker over time, and is obscured to some extent by the yellowed varnish and some scumbled overpaint, but an even more significant influence on its appearance is that it has been underpainted with smalt, again not mixed with white,

FIG. 19 NG 224, Titian, *The Tribute Money* (CAT. 6), detail showing Christ's red sleeve and blue cloak.

and as a consequence extremely degraded to the extent that the paint has become a translucent yellow-brown (see CAT. 8, FIG. 237). Ultramarine was almost always underpainted with a cheaper blue, a practice generally followed by Titian even in the paintings for his most illustrious clients. In his earlier works the underpaint was most commonly pigmented with indigo, as seen still in the sky of *The Vendramin Family* (CAT. 1, FIG. 78, and vol. 34 of this *Bulletin*, p. 27). The blue copper carbonate mineral pigment azurite seems also to have sometimes been used for this purpose throughout Titian's career, a later example being *Doge Antonio Grimani kneeling before Faith* (Palazzo Ducale, Venice),[49] commissioned in 1555. From around the middle of his career onwards, however, it became much more common for Titian to underpaint ultramarine with the blue cobalt-containing glass pigment smalt, as is the case for all of the paintings in this study except *The Vendramin Family*, the very earliest of the works. Many of the earliest examples of Italian paintings containing smalt are in wall paintings,[50] so it is perhaps interesting that it has been found to be present in Titian's fresco of Justice (Gallerie dell'Accademia, Venice), originally in the Fondaco dei Tedeschi and painted around 1508.[51] Aside from this one example, however, Titian was not an early user of this pigment, as the time when he began to employ it regularly coincides with the period when it became very common in paintings not only in Venice and Italy more generally, but all over Europe. The earliest reported occurrence in his oil paintings is that in *Charles V at the Battle of Mühlberg* (FIG. 1), dating from 1548, where it has been found in the green paint of a tree, mixed with verdigris, lead white and earth pigments,[52] and in the sky where it is mixed with azurite and some white.[53]

The main European sources of the cobalt ore (needed to make smalt) that were being worked on an industrial scale at this time were in the Erzgebirge (Ore Mountains) in Saxony and Bohemia. Despite this, it is not likely to be of significance that Titian seems to first have used smalt in a work that was painted during his stay in Augsburg, since it was already occasionally being employed by other Italian artists before 1548. The early history of smalt pigment, before around 1550, is in fact not yet settled, and although it has been said that production began in Germany in the areas around the mines, the earliest recipes that may be found for this pigment are in Italian documentary sources. As early as 1328 a document from the Fondaco dei Tedeschi records that zaffre (roasted cobalt ore mixed with varying amounts of quartz or sand) was being imported from Germany, presumably for use in Murano where blue glass coloured with cobalt was being made. Interpretation of the early recipes is complicated, however, by the fact that the terms '*smalto*' or '*smalti*' were also used for the coloured glass fluxes for enamelling, and it is often not possible to be certain that the end product really was intended for use in painting.[54]

Smalt pigment is not simply the same blue glass used for vessels and windows, crushed to be used as a pigment, but a separate product. It is far higher in cobalt content, as it needed to be very deep in colour to retain a blue hue once it was ground to a powder, and is almost always a potash glass, generally containing a large amount of potassium, with almost none of the other alkali or alkaline earth elements found in vessel or window glass. This is reflected in the recipes that clearly are for a pigment, such as that dating from the late sixteenth or early seventeenth century entitled 'To make beautiful smalt for walls' from the glass-making Darduin family active in Murano. Aside from river pebbles as a silica source and cobalt ore in the form of zaffre, the ingredients include potassium-rich tartar as a flux, rather than the sodium-rich ash from marine plants that would have been used for other glass in Italy.[55] Potassium in combination with cobalt produces a much bluer glass than sodium, which gives a slightly greyish violet-blue that is not so intense or attractive a colour, and while the scientific reasons for this have only recently been established,[56] the early manufacturers of smalt must have understood this empirically through their own practical experiments. The manufacture of smalt pigment appears to have been a specialised enterprise in the sixteenth century, with the expertise in refining and grinding it to give the best possible quality product residing in only a few production centres in Germany, Venice and the Netherlands. The evidence on the history of the mining and trade in cobalt ore, reviewed by François Delamare, in fact suggests that the Netherlands may have been the main place of manufacture during much of the sixteenth century, which may well explain the high reputation that the pigment from this area seems to have had; the sixteenth-century Paduan Manuscript and Giovanni Paolo Lomazzo's *Trattato dell'arte della pittura, scoltura et architettura* of 1585 both state that smalt from Flanders was considered to be the best,[57] and it was clearly exported all over Europe.

The zaffre that was traded was not raw cobalt ore, but a treated product made by roasting the ore to a

greater or lesser extent in order to remove arsenic, and then mixing it with different amounts of silica to give different grades that were sold at different prices.[58] Quantitative analysis using SEM–EDX of the composition of the smalt in Titian's paintings does indeed show that it contains arsenic, and in fact it seems to be present at rather high levels, always more than the amount of cobalt and sometimes even almost twice as much. The same phenomenon has been seen in all the paintings by Veronese in the National Gallery that have been examined in this way so far. Although it is not yet known whether this is significant in terms of the manufacture or origin of the pigment, it was useful already in the study here of Titian's *The Tribute Money* (CAT. 6) as it made it possible to show that a different smalt had been used on the extensions to the canvas, adding support to the argument that they are not original.[59]

Quantitative analysis also helps to distinguish between a low grade of smalt that was always weak in colour and that which has deteriorated, since the latter will contain much lower levels of potassium, as it is lost from the glass on degradation.[60] More or less all the smalt in the paintings by Titian in this study has lost its colour, with only a few larger particles that are still blue visible in the paint cross-sections. In *Diana and Actaeon* and *Diana and Callisto* the underpaint applied across most of the background, including the sky, trees and distant landscape, a mixture of smalt and lead white, is now grey. This was not fully covered by the subsequent paint layers and in *Diana and Actaeon*, near the right edge between two tree trunks, it now contrasts strongly with the broadly applied patch of ultramarine that completes the distant mountain, a transition that must have been far softer when the underpaint was still blue (FIG. 20). A similar effect can also be seen further up behind the trees (FIG. 21). In *Diana and Callisto* there are hints of variegated colour in the drapery on which Diana is seated, combining deep reddish purples with paler, more lavender highlights. The one paint cross-section taken from this drapery, from a highlight just above the hand of the nymph to the right of Diana, shows some of these hues in the complex sequence of layers formed from overlapping paint strokes in the folds in this area. At the very top of the cross-section is a fragment of a mauve layer containing lead white, ultramarine and red lake, which encroaches over the light bluish stroke of the highlight composed of the same pigments but with only a little red lake. This, in turn, partially overlaps an adjacent orange-red stroke of paint (vermilion, red lake and lead white).

FIG. 20 NG 6611, NGS 2839, Titian, *Diana and Actaeon* (CAT. 4), detail showing the blue distant mountain through the trees at the far right of the painting.

FIG. 21 NG 6611, NGS 2839, Titian, *Diana and Actaeon* (CAT. 4), detail showing the trees at the top right.

Beneath the orange-red is more purple paint, and also a thin grey layer containing lead white and degraded smalt. Much of this drapery is now rather brown, but if it was laid in with a paint composed mainly of smalt then its present appearance is perhaps to a great extent a consequence of deterioration of this pigment, with a similar effect occurring to that seen in the paintings by Veronese alluded to above.

The influence of the deterioration of smalt on the hues in *The Death of Actaeon* has been mentioned earlier, and is especially evident in the sky and in Diana's robe,

which has a somewhat brownish red colour but must have been intended as a more purple red, since smalt is mixed with red lake in the paint. The lilac of the Virgin's dress in *The Virgin suckling the Infant Christ* (CAT. 7) also has some discoloured smalt in the underpaint, which with the loose manner used to build up the modelling is probably exposed at the surface in places, since there is a hint in some areas of a slightly more dull brownish hue than might have been intended, although the highlights painted with ultramarine, red lake and white have the beautiful soft lavender colour often seen in paintings by Titian (FIG. 22). The drapery has been built up with a first layer that is predominantly pink, as was seen in Titian's early works, with different mixtures of purple then applied to achieve the various shades that were required. In the rich robes worn by Andrea and Gabriel Vendramin in *The Vendramin Family* the same technique has been used for the subtle shades, ranging from the deep purple of Gabriel's cloak, with its lighter more purple-pink cuffs, to the more red cloak worn by Andrea, with a lilac lining to the sleeve just showing beneath the raised hand (FIG. 23). Here no smalt has been used and these shades have been achieved by different layer structures and mixtures of red lake pigments with ultramarine and white, with occasionally some vermilion.

Another change seen in Titian's palette in the second half of his career, although one that had a rather more subtle influence than smalt, was that red lake pigments based on cochineal begin to be found in his works, most probably because of the availability of Mexican cochineal imported from the Americas, which came to be used in the dyeing industry in Venice in the 1540s and 1550s.[61] The dyestuffs in the red lake pigments have been analysed in six of the paintings in this study,[62] and together with existing results from other Venetian paintings among which are works by Tintoretto, Veronese and Bassano, constitute a reasonable number to use as a basis for considering trends in

FIG. 22 NG 3948, Titian, *The Virgin suckling the Infant Christ* (CAT. 7), detail showing the Virgin's mauve dress.

the different types of lake pigment that were used. It should be borne in mind that the dyestuff is rather rarely identified in these pigments so that new results, even if rather few, can make an important contribution to our knowledge of their history.[63] In marked contrast to the analyses of paintings dating from before 1540 (see vol. 34 of this *Bulletin*, p. 29), cochineal, presumably from a New World source (*Dactylopius coccus* Costa) judging by the date of these works, was identified in every sample. In three of these paintings – *Venus and Adonis*, *The Virgin suckling the Infant Christ* and *The Death of Actaeon* – this was the only dyestuff identified.

Titian's preferred type of red lake pigment in the earlier period of his career was kermes from the scale insect *Kermes vermilio* Planchon, which was still detected in samples from three of the later works (from after 1540) in the National Gallery. *The Vendramin Family*, the earliest of the pictures studied here, was probably painted between 1540 and 1545, the very beginning of the period of transition to the use of New World cochineal for dyeing, so it is perhaps unsurprising that kermes was the main dyestuff detected in a sample from the

FIG. 23 NG 4452, Titian, *The Vendramin Family, venerating a Relic of the True Cross* (CAT. 1), detail showing the purple, mauve and purple red of the cloaks of Andrea and Gabriel.

deepest red of Gabriel's cloak (FIG. 24), but a small amount of cochineal and traces of components that perhaps relate to lac dyestuff were also found to be present, with there being some evidence in the cross-section for two or even three separate lake pigments.[64] It was not possible to determine in this case whether or not the cochineal was an Old World variety or from the Americas, but there are very few examples of Old World cochineal in a red lake pigment, with the only one that has been confirmed in a National Gallery painting being in *The Adoration of the Kings* (NG 3908, 1475–80), from the workshop of Giovanni Bellini, where Polish cochineal was found. Cochineal from the Americas was being imported into Italy by way of Spain from the early 1540s; it was in use in Florence by 1542, and recorded in February 1543 as being tested in Venice, where it was at first met with some suspicion but by the 1550s had become very common.[65] If the cochineal dyestuff in the lake pigment in *The Vendramin Family* does originate from a New World variety it would represent a rather early example of its use, but given its rapid adoption for dyeing cloth this would not seem impossible, even considering the dates for the painting proposed here. Interestingly, one other similar result is known, from Lorenzo Lotto's *Portrait of Giovanni della Volta with his Wife and Children* (NG 1047), also painted in Venice and completed by 1547: a sample from the woman's pink skirt was found to contain principally kermes but with some cochineal in addition.[66]

The presence of a very small amount of lac in the sample from *The Vendramin Family* is also unusual among the existing red lake analyses from Titian paintings, but it has been found in combination with other dyestuffs in several works by Jacopo Tintoretto. In *Christ carried to the Tomb* (National Galleries of Scotland, Edinburgh, Inv. NGS 2419), for example, lac was identified on its own in the dark purplish glaze from the Virgin's skirt, in combination with kermes in scarlet glazes from the sleeve of the woman with the taper and the orange drapery hanging below Christ's body, and combined with cochineal in the more crimson draperies below Christ.[67] Lac was also detected as the only dyestuff in the red drapery beneath the figure of Venus in Jacopo Tintoretto's *The Origin of the Milky Way* (NG 1313).[68] The normal method of production for lac-based red lake pigments was direct extraction from the sticklac using an alkaline solution, rather than indirectly through the use of dyed textile shearings as was most common for kermes, cochineal and madder,[69] so it is possible that the traces of lac dye in the sample from *The Vendramin Family* are in a separate pigment rather than having been introduced into a single pigment together with the other dyestuffs through the use of mixed textile shearings, or shearings from a cloth dyed with a mixture of dyestuffs.

FIG. 24 NG 4452, Titian, *The Vendramin Family, venerating a Relic of the True Cross* (CAT. 1), detail showing the modelling in Gabriel's cloak.

In *The Tribute Money*, a work painted two decades later, kermes was once more identified as the major dyestuff in the sample that was analysed (FIG. 19), with some cochineal also present, but this time almost certainly from the Americas, since by this date its use was well-established within the dyeing industry in Venice. In this case it was not possible to determine if the two dyestuffs were incorporated into the same lake pigment or used as separate pigments. In *Diana and Callisto*, however, where mainly cochineal with some kermes was found in a sample from the pink dress of the nymph to the right of Callisto, ATR–FTIR microscopic analysis of a cross-section suggested that two separate pigments were used, one of which, most likely the kermes lake, contains protein within the pigment particles indicating it was prepared from the dyed shearings of woollen textiles. Other lake pigment particles in the sample, probably the cochineal lake, had a different substrate containing a higher proportion of alumina; these were generally in different layers to the particles that are likely to be the kermes lake.

In the early paintings from before 1540, although kermes was the dominant dyestuff identified in red lakes in Titian's works, in most cases the HPLC analyses indicated the presence of a second dyestuff, a pseudopurpurin-rich madder from Rubia tinctorum L., always in a separate lake pigment and generally used as an underpaint as would be expected considering that it would have been cheaper than lakes derived from the precious kermes dyestuff. In one work, *The Music Lesson* (NG 3;

CAT. 12 in vol. 34 of this *Bulletin*), a small amount of dyestuff from a soluble redwood (sappanwood) was found together with madder and kermes. In contrast, in the group of late works no plant-based red dyestuffs were identified in any sample, although they must occasionally have been used to make red lakes since some madder together with cochineal has been reported in the version of Titian's *Venus and Adonis* in the J. Paul Getty Museum, Los Angeles.[70]

Venice was an important centre of the dyeing industry, and with its position as a major trading city, it is not surprising to find a variety of dyestuffs in the lake pigments used by Titian. It is clear, however, that the predominant lake pigment in his paintings from the second half of his career was that based on cochineal, following the same trend observed in analyses of red lakes in other Venetian paintings of similar date, and it seems no coincidence that it begins to be used so widely when the American variety, far richer in dyestuff and therefore more economical, was introduced. Cochineal was found in every red lake sample from Paolo Veronese's National Gallery paintings that has been analysed – from *The Rape of Europa* (NG 97, about 1570) and two of the four Allegories of Love, *Unfaithfulness* (NG 1318) and *Happy Union* (NG 1326), both from about 1575 – and in samples from several paintings by Tintoretto from the *Gonzaga Cycle.*[71] It seems even so that kermes also continued to be used, even if to a lesser extent; it must certainly still have been in demand, since in 1551 the Bishop of Senez estimated the kermes harvest for the Arles region of Provence to be worth 11,000 gold *sous*,[72] and kermes is noted as being sold in the Fondaco dei Tedeschi in 1572.[73]

Even if there was a change in the type of red lake pigment that Titian most often used, the way in which he built up his pink draperies was the same as earlier in his career, with opaque pink shades seen interspersed with deep translucent red layers in the cross-sections as a result of overlapping brushstrokes and his habit of working over the modelling with an almost white paint before applying the final red lake glazes, typical examples being Gabriel's cloak in *The Vendramin Family* (FIG. 24), and the drapery of the nymph beside Diana in *Diana and Callisto* (CAT. 5, FIGS 163–7). At the very bottom of the cross-section is the first underpaint, a more orange-red tone containing mainly vermilion with some red lead; in *Diana and Actaeon* a very similar mixture was used higher up in the layer structure for the more orange-red curtain (FIGS 25–7).

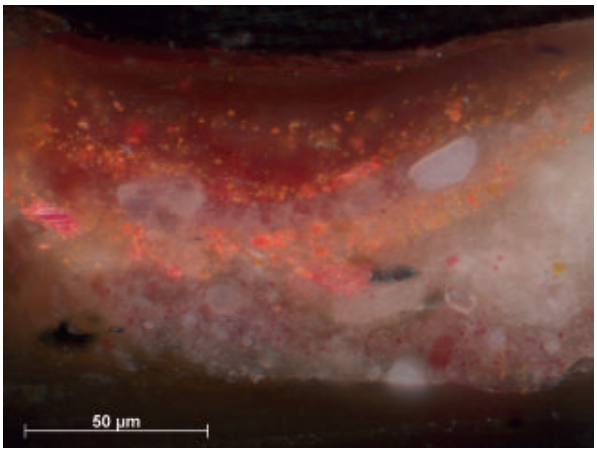

FIG. 25 NG 6611, NGS 2839, Titian, *Diana and Actaeon* (CAT. 4), paint cross-section from the red curtain.

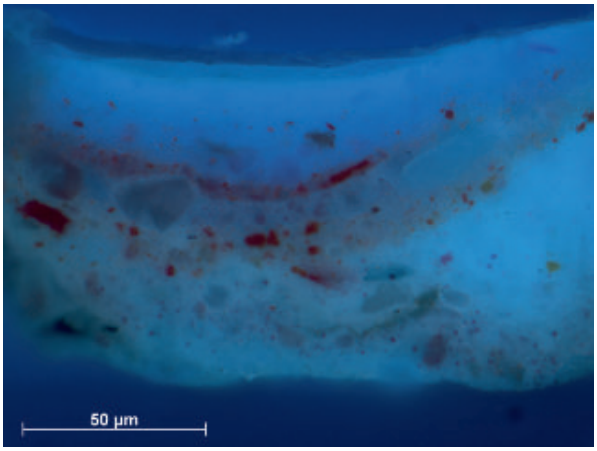

FIG. 26 NG 6611, NGS 2839, Titian, *Diana and Actaeon* (CAT. 4), paint cross-section from the red curtain under ultraviolet illumination.

FIG. 27 NG 6611, NGS 2839, Titian, *Diana and Actaeon* (CAT. 4), detail showing the modelling in the red curtain.

The large tabular well-formed particles of vermilion in the more opaque bright red lines in the vaulting of the arches behind the curtain are typical of the dry-process pigment. As in the underpaint for the red draperies, it is not used alone – nor is it anywhere else in the other late paintings by Titian in the National Gallery – but is mixed with some red lead, which has probably protected it from the darkening that can often occur. A similar mixture is likely to have been used for the red stockings of the smallest boy in *The Vendramin Family* (FIG. 28), but the paint of the orange doublet just visible at the neck of one of the boys in the group at the left is mainly an intensely coloured red earth, with only a little vermilion. Although orange draperies based on a combination of the arsenic sulphide mineral pigments realgar and orpiment have been said to be typical of Venetian paintings of this period – and are indeed seen quite regularly in works by Veronese and Tintoretto – they were not used to the same extent by Titian, especially in his later works. In the early *Holy Family with a Shepherd* (NG 4; CAT. 4 in vol. 34 of this *Bulletin*) of about 1510, Joseph wears a strongly orange cloak painted with red and yellow earth but with orpiment and realgar in the lighter areas, set against a robe of the complementary colour purple. In his later works, orange is used more for small touches that help to create an impression of lively variations in hue: such as the lining of Actaeon's boots in *Diana and Actaeon* visible where they are folded back, painted with red earth and a little vermilion; or the orange stripes on the dress of the handmaiden at the far right edge, painted with vermilion mixed with lead white (FIG. 29); and the orange quiver in *Diana and Callisto*, a mixture of vermilion, red lead and a little black (FIG. 30); as well as the delicate bright orange touches that highlight Callisto's skirt where it is catching the light as it is held up by one of the nymphs, which seem to have been painted with red lead alone (FIG. 31).

The only work among Titian's later paintings in the National Gallery that contains an arsenic sulphide pigment, in this case yellow orpiment, is *The Tribute Money*, in the brightest highlights on the Pharisee's tunic, which is more yellow than orange, used in combination with a brownish yellow earth (FIG. 32).[74] A rather dull yellow earth was used for the vault of the arches in *Diana and Actaeon*, but that in the drapery at the top right of *Diana and Callisto* is brighter, containing a high proportion of yellow iron oxide. The orange shadows are based on an orange-red earth pigment, again quite intense in colour.

Yellow earths were also mixed with verdigris for some of the darker greens of foliage, but the predominant yellow was lead-tin yellow (FIG. 33). In 1584 Raffaello Borghini lists several different types, under the names '*giallolino di vetro*', '*giallolino di Fiandra*' and '*giallolino da Venezia*'. The term '*giallolino da fornace*' appears in other sources, and in the 1572 documents connected with the purchase of pigments for El Escorial through Alvise dalla Scala and Titian's son Orazio a lead-based yellow named '*giallo lino de Murano*' is mentioned, connecting its manufacture more specifically to the glass-making furnaces in the city.[75] The variety of lead-based yellows listed in the historical sources under the general term '*giallolino*' (pale yellow) is reflected in the analytical results for sixteenth-century Italian paintings. The most common is lead-tin oxide with the composition Pb_2SnO_4, which has been designated 'type I'. This was the only form found in the National Gallery

FIG. 28 NG 4452, Titian, *The Vendramin Family, venerating a Relic of the True Cross* (CAT. 1), detail showing the small boy's red stockings.

FIG. 29 NG 6611, NGS 2839, Titian, *Diana and Actaeon* (CAT. 4), detail of the striped dress of the handmaiden at the far right.

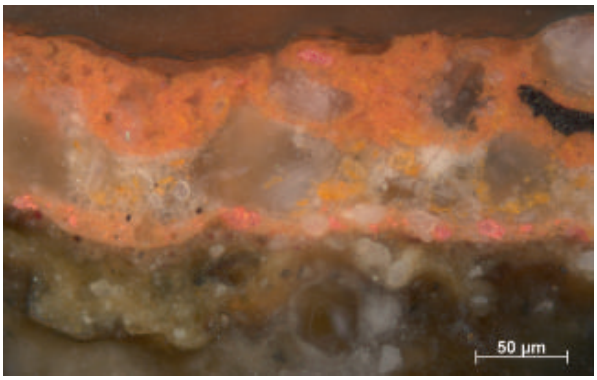

FIG. 30 NG 6616, NGS 2844, Titian, *Diana and Callisto* (CAT. 5), paint cross-section from the orange quiver.

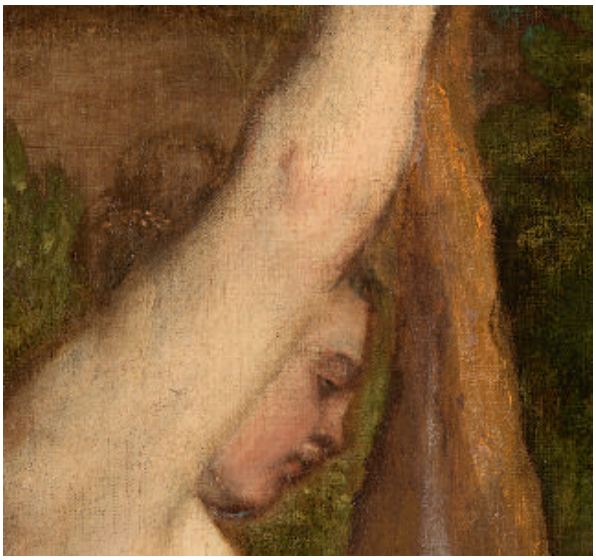

FIG. 31 NG 6616, NGS 2844, Titian, *Diana and Callisto* (CAT. 5), detail showing the orange highlights on Callisto's skirt lifted by one of the nymphs.

FIG. 32 NG 224, Titian, *The Tribute Money* (CAT. 6), detail showing the Pharisee's yellow tunic.

FIG. 33 NG 6616, NGS 2844, Titian, *Diana and Callisto* (CAT. 5), detail showing the lightning in the sky painted mainly in lead-tin yellow.

paintings by Titian, and as in the earlier works it often showed signs of incomplete roasting during manufacture, since unreacted white tin oxide, one of the starting materials, was found to be present (FIG. 34), a circumstance that would probably have meant that the pigment produced was rather pale, perhaps deliberately (see vol. 34 of this *Bulletin*, pp. 29–30). A second type of lead-tin yellow – 'type II' – which has a different crystal structure and a vitreous character, with silica present in addition to lead and tin, can probably be associated with *giallolino*

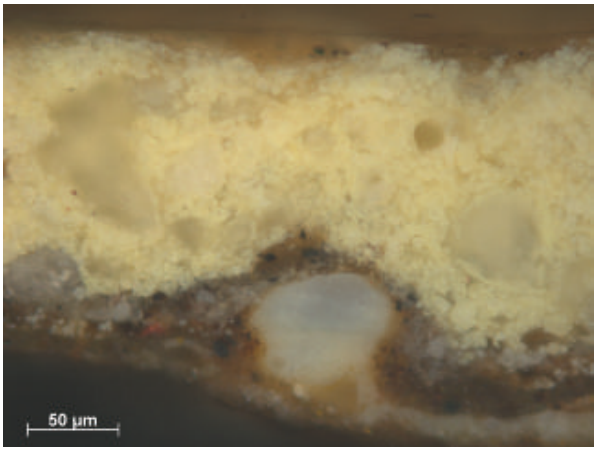

FIG. 34 NG 6420, Titian, *The Death of Actaeon* (CAT. 8), paint cross-section from the yellow bush. In the thick paint composed of mainly lead-tin yellow translucent white areas are visible, some of which are lead soaps formed by reaction of the pigment with the oil medium, while others are unreacted white tin oxide.

di vetro. This type is used often in Italian trecento paintings but then disappears around the middle of the fifteenth century, reappearing briefly in the late sixteenth century in Venice, in paintings by Veronese and Tintoretto, where both are sometimes found in the same painting, probably used to achieve different shades as 'type II' is a slightly warmer yellow.[76] It has not been found in paintings by Titian, but another lead yellow, lead-antimony oxide, Naples yellow – also warmer in colour than 'type I' – has been reported in his *Ecce Homo* (Kunsthistoriches Museum, Vienna) of 1543,[77] and has been found together with lead-tin yellow in *La Bella* (Galleria Palatina, Florence) of around 1536 and *Girl with a Platter of Fruits* (Gemäldegalerie, Berlin) of about 1555.[78]

Lead-tin yellow was an essential component of Titian's green paints, mixed with verdigris, as for example in the deep green tunic of the smallest boy in *The Vendramin Family* (FIG. 35), and in the lighter parts especially of the green altarcloth. The same mixtures were used for foliage, as can be seen in the lightest yellow-green leaves on the large bough of the tree hanging down in the middle of *Diana and Callisto*. The darkest green leaves are verdigris alone, and while some of the foliage paint seems to be intentionally brown, there is evidence from samples that in other places the verdigris has darkened (FIG. 36), an effect that has also occurred in *The Death of Actaeon* (CAT. 8, FIGS 244 and 246). A more distinctive aspect of the greens in both *Diana and Actaeon* and *Diana and Callisto* is the cool bluish-green used for some of the brightest leaves on the large trees, and to highlight the smaller trees and bushes in the distant landscape, which is composed of coarsely ground natural mineral malachite, giving the paint not only a characteristic colour but also a very evident texture (FIGS 37 and 38). This pigment does not appear to have been used very often by Titian, but Tintoretto and especially Veronese did use it regularly (although unlike Titian, they used it mainly in underpaint rather than as a different hue to that given by other green pigments), and while it is hardly found at all in oil paintings in the first half of the sixteenth century it seems that by the second half, in Venice at least, it was becoming reasonably widespread.[79]

FIG. 35 NG 4452, Titian, *The Vendramin Family, venerating a Relic of the True Cross* (CAT. 1), detail showing the small boy dressed in green.

FIG. 36 NG 6616, NGS 2844, Titian, *Diana and Callisto* (CAT. 5), detail showing the deep green foliage on the tree at the top of the painting.

FIG. 37 NG 6611, NGS 2839, Titian, *Diana and Actaeon* (CAT. 4), detail showing the bright green leaves on one of the tree branches, painted with malachite.

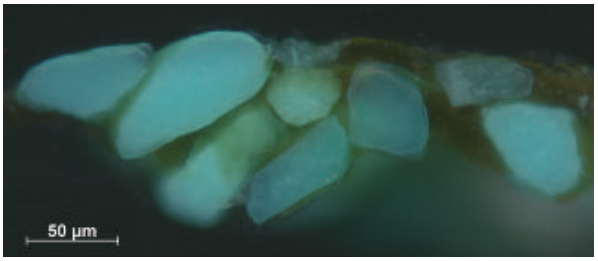

FIG. 38 NG 6611, NGS 2839, Titian, *Diana and Actaeon* (CAT. 4), paint cross-section from one of the bright green leaves, showing large particles of malachite.

Paint handling and development of the 'late style'

In volume 34 of the *National Gallery Technical Bulletin*, dedicated to the first half of Titian's career, it was demonstrated that even in his very earliest works Titian painted with widely differing levels of finish and refinement. This distinction, which can make the dating of his paintings so problematic, was to continue. The magnificent portrait of Pope Paul III, Alessandro Farnese (FIG. 39), is believed to have been painted in Bologna in 1543, the same year that Titian completed for Palazzo D'Anna in Venice the large *Ecce Homo* (Kunsthistorisches Museum, Vienna, Inv. 73), a work notable for its breadth of execution, and very possibly also a year in which he was working on *The Vendramin Family* (CAT. 1). The elegance of the Pope's hands with their gleaming fingernails and the detailed observation of his face, with fine individual hairs painted for his beard and bushy eyebrows (FIG. 40), can be compared with the less polished rendition of the head of Andrea Vendramin in the National Gallery canvas (FIG. 41). Here the brush marks that describe his features are left clearly visible, and the directness of the technique has much in common with

FIG. 39 Titian, *Portrait of Pope Paul III*, 1543. Oil on canvas, 137 × 88.8 cm. Naples, Museo Nazionale di Capodimonte, Inv. 130.

FIG. 40 Titian, *Portrait of Pope Paul III* (FIG. 39), detail showing the sitter's head.

FIG. 41 NG 4452, Titian, *The Vendramin Family, venerating a Relic of the True Cross* (CAT. 1), detail showing Andrea's head.

that of fresco painting. The painting of the draperies too, with their stabbing parallel diagonal strokes across the transitions between highlight and shadow (FIG. 42), is reminiscent of Titian's past experience in wall painting, and indeed some of his early works on canvas (see vol. 34 of this *Bulletin*, pp. 40–1).

FIG. 42 NG 4452, Titian, *The Vendramin Family, venerating a Relic of the True Cross* (CAT. 1), detail showing the red drapery.

FIG. 43 Titian, *Portrait of Pope Paul III* (FIG. 39), detail showing the *mozzetta* and hand.

The glazes of translucent red lake that complete the modelling of the red and purple robes in *The Vendramin Family* are rich and deep, as are those in the *Portrait of Pope Paul III* (FIG. 43). Here Titian allowed the paint application that describes so brilliantly the velvet of the *mozzetta* to be visible, especially the red dabs to indicate the slight puckering along the lower edge. In the case of the unfinished group portrait of *Pope Paul III and his Grandsons* (FIGS 2 and 44), however, the glazing of the red cap and *mozzetta* has barely begun. A small amount of red lake seems to have been applied to the deepest shadow at the back of the Pope's shoulder but the rest of the red has been left as an underpainting, as has his clenched hand.

There is a clear difference between a work such as the group portrait, evidently left incomplete, and a painting with a lack of finish – in the sense of polish or refinement in its execution – such as Titian's bold and vigorous portrait of his friend Pietro Aretino (FIG. 45), painted in 1545 as a diplomatic gift to Cosimo de' Medici, Duke of Florence. The painting must have represented quite a challenge to the Florentine tradition as exemplified by the portraiture of Bronzino. In a letter to the Duke, Aretino complained that Titian would have presented his garments in a richer and more complete way if the painter had been paid more. At the same time, in a letter

FIG. 44 Titian, *Pope Paul III and his Grandsons* (FIG. 2), detail showing the *mozzetta*.

FIG. 45 Titian, *Portrait of Pietro Aretino*, 1545. Oil on canvas, 96 × 76.6 cm. Florence, Palazzo Pitti, Galleria Palatina, Inv. 54.

to Titian himself, he accused him of leaving his portrait 'more sketched than finished'. However, he also praised the portrait for its impressive power and while his comments are usually taken to indicate his displeasure at the roughness of technique they can also be interpreted as Aretino being amused and flippant and actually appreciating Titian's *bravura* in the execution of his portrait.[80]

Cultivated collectors and connoisseurs of the time were coming increasingly to value the quality of *prestezza* (quickness) and the *non finito* in painting,[81] especially since it exemplified the gentlemanly virtue of *sprezzatura*, or studied carelessness and effortless ease, as described by Baldassare Castiglione in his *Book of the Courtier*. An evidently conscious display of different levels of finish appears in the paintings of Parmigianino, who could produce works of exquisitely polished refinement alongside paintings such as *The Mystic Marriage of Saint Catherine* (FIG. 46), painted probably in the late 1520s, which exhibits bold sweeping brushwork with noticeable breaks in the paint film made possible by the use of a brown priming that forms a neutral recessive base colour. Parmigianino's elegance and the swirling grace of his brushwork were brought to Venice by Andrea Schiavone, whose works were much admired by collectors of the time (FIGS 47 and 48). In a letter of 1548 Aretino refers to Titian's admiration of Schiavone's '*bozze di istorie*' or sketchy figure compositions, and this may well have played a part in the development

FIG. 46 Parmigianino, *The Mystic Marriage of Saint Catherine* (NG 6427), *c.*1527–31. Oil on wood, 74.2 × 57.2 cm.

FIG. 47 Andrea Schiavone, *Arcas Hunting* (NG 1883), *c.*1550. Oil on canvas, 18.8 × 18.4 cm.

FIG. 48 Andrea Schiavone, *Jupiter seducing Callisto* (NG 1884), *c.*1550. Oil on canvas, 18.7 × 18.9 cm.

FIG. 49 Jacopo Tintoretto, *Saint George and the Dragon* (NG 16), *c*.1555. Oil on canvas, 153.3 × 100.5 cm.

of what has come to be known as Titian's 'late style'.[82] Other Venetian painters too were beginning to explore the possibilities of visibly free and expressive painting handling, notably the young Tintoretto (FIG. 49).[83]

Around Italy such techniques were debated. Although Vasari clearly shared Michelangelo's views about the lack of true *disegno* in Titian's paintings, having visited Venice in 1566 he wrote perceptively about the later works in the second edition of his *Vite*, explaining how the bold strokes and *macchie* (patches or smudges), which when viewed from close make little sense, appear perfect from a distance. He also stressed the hard work behind the apparent nonchalance and observed that those who wished to imitate him produced clumsy works because they did not understand the extent to which Titian 'has retouched his pictures, going over them with his colours several times, so that he must obviously have taken great pains'; in this way he made them 'appear alive', the 'great artfulness, hiding the effort involved'.[84] The Neapolitan botanist Bartolomeo Maranta seems to have had no difficulty in appreciating the very loosely executed canvas of *The Annunciation* produced by Titian in around 1560 for a chapel in the church of San Domenico, Naples, praising it for its 'pleasing vivacity of colour' but 'without too much brilliance which offends the eye'.[85]

Nevertheless, it seems to have taken time for some of Titian's international clients to understand his painting and, initially at least, he appears to have adapted his technique to a certain extent in order to conform to their expectations. Much of his production for Charles V is notable for its restraint and for the inclusion of what appears to be fine detail in the depiction of the splendid costume and trappings of the imperial court, even if on close inspection the abbreviated means by which he achieved this impression are apparent. The young Prince Philip, brought up surrounded by paintings from Northern Europe, is also likely to have been unused to Venetian techniques, which may have influenced Titian's somewhat cautious paint handling in the first two *poesie* for Philip – *Venus and Adonis* and *Danaë* (FIGS 106 and 107).[86] The fact that they were whole or partial replicas of pre-existing designs also explains the lack of creative verve in their execution. The contrast with the two 'Diana *poesie*' (CATS 4 and 5) is remarkable. Philip seems to have come to understand better how to view Titian's brushwork, perhaps following the example of his aunt, Mary of Hungary, who, in 1553 on sending to Mary Tudor a portrait of her nephew painted by Titian, noted that it should be seen from a distance 'like all the paintings of the said Titian, which cannot be recognised from close by'.[87] Titian's development of the broad handling with passages of *non finito* that has come to be characterised as his 'late style' seems to coincide roughly with the production of the 'Diana *poesie*', but also with the completion of the altarpiece of *The Martyrdom of Saint Lawrence* (see FIG. 11). In this case, its eventual location on a dimly lit altar meant that all his attention could be given to the more strongly illuminated parts of the nocturnal composition, while passages in shadow were left in a much abbreviated if not incomplete state.[88]

Even in those paintings of the 1550s and 1560s with flamboyantly visible brushwork there are often passages of more refined and closely observed detail, especially in the depiction of metalwork, such as the links of a chain or golden jewellery. It has sometimes been suggested that the ageing Titian would no longer have been capable of painting such detail and that it was

therefore delegated to the workshop. Niccolò Stoppio's much quoted letter of 1568, however, in which he states that the painter's hand now trembled so much that he could no longer 'bring anything to completion, but leaves this to his pupils', has to be interpreted with some caution since his malice may have been triggered by Titian's new association with a fellow dealer in antiquities, Jacopo Strada, the subject of Titian's last great portrait, probably painted in 1567–8 (Kunsthistorisches Museum, Vienna, Inv. 81).[89] This work shows no sign of any weakness in the painter.[90] Even if Titian had developed a tremor he could have steadied his brush hand by means of a mahl stick. In certain cases the rendition of an embroidered textile or a string of pearls, for instance, may appear rather uniform and repetitive, and might suggest delegation, but often the variety of touch and the intelligence of the application of highlights suggests that these are by of the creator of the work.

In addition, while Titian would certainly have been affected by the reduction of near vision with age and possibly by other forms of deterioration such as cataracts,[91] he could perfectly well have corrected this to some degree by wearing magnifying spectacles (FIG. 50) as depicted in *The Tribute Money* (CAT. 6), itself a work painted with much fine detail. It is impossible to believe that he was not responsible for the execution of the exquisite jewels and above all the terrified face of Lucretia, complete with glinting tears, in the very late canvas of *Tarquin and Lucretia* (FIGS 51–2), painted according to

FIG. 50 NG 224, Titian, *The Tribute Money* (CAT. 6), detail showing the old man.

FIG. 51 Titian, *Tarquin and Lucretia*, 1571. Oil on canvas, 188.9 × 145 cm. Cambridge, Fitzwilliam Museum, Inv. 914.

Titian himself over the course of three years 'with greater labour and artifice than anything, perhaps, that I have produced for many years' and sent to Philip II in 1571/2.[92] *Tarquin and Lucretia* also exemplifies another feature of several late works, including the much discussed *Flaying of Marsyas* (Archbishop's Palace, Kroměříž, Inv. KE 2370,0,107), in that these passages of fine detail are set against other areas that are freely and broadly painted – for example, the highlights of Tarquin's breeches. This variable focus can be explained by the presbyopic painter putting on and removing his spectacles but also seems to imply that the paintings themselves no longer have a fixed viewing distance, but should be examined from both near and far.

As well as this play between differing levels of finish and fine detail, many late works also display a range of paint textures and thickness. Passages of the 'Diana *poesie*' and also *The Tribute Money* are very thinly painted, so that the texture of the canvas weave is not filled with paint and remains evident. Occasionally an entire painting was achieved in this way: for example, *Portrait of a Dominican* (Galleria Borghese, Rome, Inv. 188) and the *Christ on the Way to Calvary* (FIG. 53) destined for Philip's private oratory at the side of the

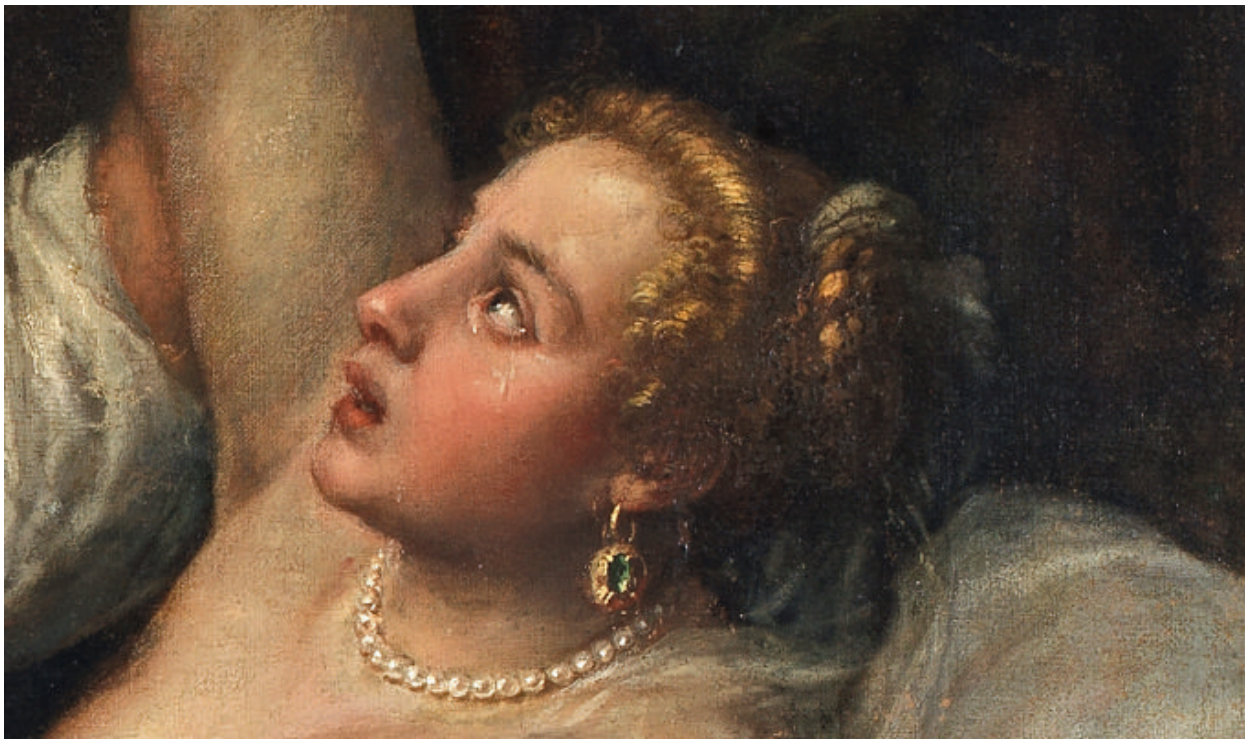

FIG. 52 Titian, *Tarquin and Lucretia* (FIG. 51), detail showing Lucretia's head.

FIG. 53 Titian, *Christ on the Way to Calvary*, *c.*1560–5. Oil on canvas, 98 × 116 cm. Madrid, Museo Nacional del Prado, Inv. P00439.

FIG. 54 NG 224, Titian, *The Tribute Money* (CAT. 6), detail showing Christ's hand.

high altar of the Church of El Escorial. Although this work must have been completed in advance of the building of the oratory it was clearly intended for private devotion and it has much in common with parts of *The Tribute Money* in its thinness and delicacy of technique, especially the use of an apparently lean paint applied with a barely loaded brush for parts of the flesh painting.[93] The dry, almost scratchy painting of the scourge marks on Christ's forearm is similar to the wrinkled flesh of the Pharisee in the National Gallery painting.

The dragging of brushes charged with relatively little paint seems also to have been one of Titian's techniques for achieving the soft, broken contours that feature in so many later works (see, for example, CAT. 7). Sometimes a small amount of colour was lightly smudged beyond the boundary of the form described and in the case of red lakes, which form rather fluid paints when bound in oil, the paint may quite literally have bled into the surrounding area. The latest version of Titian's *Danaë* composition (the one in the Prado, Inv. P00425, and now recognised as dating from about 1560–5) exemplifies this use of diffused colour to blur the distinction between flesh, white linen and crimson fabric. On a lesser scale, when applying the final red lake glazes to *The Tribute Money*, the incursion of the lake over the white of Christ's left cuff (FIG. 54) is a touch that adds vibrancy in a different way to the broken stroke of lead white over the lake on his other sleeve. Similarly, the translucent red-brown paint applied down the back of the left calf of the standing nymph in front of Callisto in *Diana and Callisto* (FIG. 55) spreads well beyond the firmer and more muscular bluish grey contour. The pale pink of Callisto's knee behind reflects through the thin paint of the final stroke, giving a soft warmth and fleshiness to the nymph's leg. A thin touch of what appears to be the same colour was swept, illogically but effectively, around the edge of Callisto's chemise. Down the front of the nymph's left shin and also her right thigh the stronger lighting means that the edges are just lightly indicated with the thinnest of dragged brushstrokes, the demarcation between her limbs and those of Callisto suggested more by subtle modulation of the different hues and tones of pink. This dissolution of the contours contributes greatly to the dynamism and implied movement within the figure group.

The buttery texture of lead white that has been ground by hand in a drying oil makes it well suited to painting the light dragged strokes that catch only on the tops of the canvas threads and underlying paint layers, leaving breaks in the white paint film where it has not filled the depressions. Titian had long exploited the vibrant effects obtained with these 'broken' brushstrokes (see vol. 34 of this *Bulletin*, p. 26) and they feature in many of the later works discussed here. An example is the streak of lead white paint at the upper edge of the canopy in *Diana and Callisto* (FIG. 56). This is blatantly no more than a mark made with a paintbrush, yet we accept it as one of the cords that secures the fabric to the branches of the tree over which it is draped. The painting of the pattern on the fabric, only just recognisable as consisting of unicorns, also exploits the properties of lead white (FIG. 57), here perhaps partly worked wet-in-wet into the yellow beneath, but forming ridges and swirls of white impasto at the brightest points. The highlights on the vase in *Diana and Actaeon* (FIG. 58) are indeed Vasari's '*macchie*' (patches of paint) and would seem to have been placed casually and even approximately. As Vasari recognised, however, they are more calculated than they appear and at the correct viewing distance it is possible to read them as the gleaming reflections of the white towel held by the nymph drying Diana's foot and perhaps even a hint of the nymph's leg.

In certain of the paintings from Titian's last years the increased extent of boldly evident brushwork of this

FIG. 55 NG 6616, NGS 2844, Titian, *Diana and Callisto* (CAT. 5), detail showing the nymph's legs.

FIG. 56 NG 6616, NGS 2844, Titian, *Diana and Callisto* (CAT. 5), detail showing the strings holding the drapery at the upper right.

FIG. 57 NG 6616, NGS 2844, Titian, *Diana and Callisto* (CAT. 5), detail showing the unicorn design on the drapery upper right.

character has led some to question whether they were ever finished or whether they were left lacking final touches and glazes that would have suppressed or reduced the impact of the paint handling. *The Death of Actaeon* has been described as unfinished, going as far back as the first documentary mention of the work early in the seventeenth century, and aspects of the painting (discussed more fully in the catalogue entry, CAT. 8) could certainly be taken to be incomplete. These include the extraordinary rendering of the plant in the foreground (FIG. 59), where Titian has exploited the properties of lead-tin yellow paint, similar to those of lead white, to paint parts of the whirling foliage with dry broken strokes and others with the brush so loaded with paint that it seems to have dribbled down the surface of the canvas in the case of the very bright leaves at the centre of the topmost spray. Yet there is no means by which these leaves could be more highly finished without completely covering this brushwork. Moreover, there is no evidence in X-radiographs of the more highly finished paintings from the last decade – mainly those

FIG. 58 NG 6611, NGS 2839, Titian, *Diana and Actaeon* (CAT. 4), detail showing the highlights on the jar.

FIG. 59 NG 6420, Titian, *The Death of Actaeon* (CAT. 8), detail showing the bush in the foreground.

FIG. 60 Titian, *Nymph and Shepherd*, *c*.1570–5. Oil on canvas, 149.3 × 186.3 cm. Vienna, Kunsthistorisches Museum, Inv. 1825.

sent to Spain (for example, *The Tribute Money* and *Tarquin and Lucretia*) – to suggest that underlying them there is an underpainting handled in the same way as the surface paint of *The Death of Actaeon* or the *Nymph and Shepherd* (FIG. 60), a canvas that has also sometimes been described as incomplete. Following the recent cleaning of the Vienna painting some of the ambiguity of the composition has been resolved. Although, in common with other late works, its appearance has certainly been affected by its past conservation history and by alterations to some of the pigments, it has been convincingly argued that Titian is likely to have regarded the painting as finished.[94] Although damaged, the flesh tints of the nymph were finely painted and nuanced in hue, and the turbulent sky and distant landscape contribute to the mood of the painting in the same way as in *The Death of Actaeon* (FIGS 61 and 62). The grass and foliage in the right foreground are just as broadly painted as the bush in the National Gallery painting. In common with the latter, the *Nymph and Shepherd* is also more colourful than it appears on first sight, but the fragmenting of the colour areas results in a muted overall effect.

If these two canvases were actually incomplete it would be remarkable for Titian to have brought them both to such a similar level of finish at the point of his sudden death. Indeed, it cannot even be assumed that paintings known to have been in his studio when he died – such as the Munich version of *The Crowning of Thorns* and the Hermitage *Saint Sebastian* (FIG. 63) – must be unfinished, at least in a conventional sense.[95] The *Saint Sebastian* has a heavy discoloured varnish but it is still possible to see that details such as the arrows are complete, including trickles of blood from the wounds,

FIG. 61 Titian, *Nymph and Shepherd* (FIG. 60), detail.

FIG. 62 NG 6420, Titian, *The Death of Actaeon* (CAT. 8), detail showing the background.

and the distant landscape is no more roughly painted than those of the Vienna and London paintings. In its present condition the cuirass is certainly difficult to read, but equally it is hard to see how it could be refined further. The Saint's lower left leg appears unfinished but the same can be said of parts of the first version of *The Martyrdom of Saint Lawrence*, placed on its Venice altar almost twenty years before Titian's death, and the second version of *The Entombment*, almost certainly the painting presented in 1572 by the Venetian Senate to Antonio Pérez, Philip II's chief minister, in which the trailing hand of the dead Christ is as incomplete as Saint Sebastian's leg.[96]

In the last years of his life, Titian's approach to painting, with its disruption of defined colour boundaries and without logical layer structures of opaque underpaintings completed with highlights and glazes of related hue, meant that he himself may not always have been able to determine the point of completion. Some of these late works were perhaps never fully resolved to the painter's satisfaction. Any passage of painting had the potential to be developed and adapted on each occasion that he came back to work on the picture. On the other hand, to knowledgeable collectors many of them seem to have been acceptable as finished paintings. We would not expect scientific examination to clarify whether or not these late paintings were finished in Titian's eyes, since their complex interlaced surfaces yield cross-sections from neighbouring locations that show great variation in paint structure. However, what is very valuable is our better understanding of the condition of these works, including the ways in which pigment changes have altered their appearance, sometimes even contributing to a sense of lack of finish. These findings should be taken into consideration in any future discussion of an issue that will divide opinion for as long as these last canvases continue to fascinate painters, art historians and gallery visitors alike.

FIG. 63 Titian, *Saint Sebastian* (FIG. 8), detail.

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