



Rembrandt Now

Technical Practice, Conservation and Research

Edited by Marika Spring and Ashok Roy

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Preface

To coincide with the exhibition *Rembrandt: The Late Works* (15 October 2014–18 January 2015) at the National Gallery in London and co-organised with the Rijksmuseum, Amsterdam, a three-day scholarly conference *Rembrandt Now: Technical Practice, Conservation and Research* (13–15 November 2014) on Rembrandt's technical practice for painting was hosted at the National Gallery.

While the exhibition focused on Rembrandt's paintings from the early 1650s until the end of his career, the conference papers considered the results of technical research on Rembrandt spanning the whole of his career and included papers given by Rembrandt experts from the Netherlands, Germany, Belgium, France, the USA and Britain. The contributions also covered new revelations brought about by major conservation treatments of paintings by Rembrandt in the five years prior to the exhibition, as well as through the application of newer analytical and imaging technologies. The conference also included a paper (contained within this volume) given in tribute to Dr Karin Groen (1941–2013), a renowned Dutch conservation scientist, whose ground-breaking work elucidated the material nature and techniques of a great range of Dutch 17th-century paintings, at the centre of which was a particular interest in the works of Rembrandt. The keynote lecture of the conference ('The relevance of research on Rembrandt's painting technique') was

given by the leading scholar in Rembrandt technical research and its application to interdisciplinary studies of the painter's work, Professor Ernst van de Wetering (1938–2021), former director of the Rembrandt Research Project, founded by the NWO in the Netherlands in 1968. This volume, generously sponsored by the Siebold Stichting Foundation, which also provided full support for the conference, brings together a selection of the papers presented at the conference.

*This volume is dedicated to the memory of
Karin Groen and Ernst van de Wetering*

Supported by the Siebold Stichting Foundation and Fukushima Medical University. Alongside supporting exhibitions and publications devoted to Dutch art of the seventeenth century, the Siebold Stichting Foundation works with Fukushima Medical University on art therapy projects to help those affected by the 2011 tsunami in Japan.

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Cover image: Detail from Rembrandt, *A Woman Bathing in a Stream (Hendrickje Stoffels?)*, 1654. © The National Gallery, London.

In search of Rembrandt's underdrawing

Jørgen Wadum

ABSTRACT Since the initiation of the Rembrandt Research Project in the late 1960s, technical study of Rembrandt's paintings has gained increasing importance in the understanding of his working methods. Examining the artist's works with dendrochronology, X-radiography and macro photography became the norm complemented by cross-sections of ground and paint layers as well as scientific analysis of binding media and pigments. Significant advances were made in understanding the materials and properties of the master's use of and experimentation with supports and mediums. However, although some infrared photographs were taken, examination of early Rembrandt paintings using infrared reflectography (IRR) was not employed until the astonishing 1998 discovery of an extensive underdrawing below the paint layers of the painting once considered to be a cornerstone of Rembrandt's early works: the *Young Self-Portrait with a Gorget* from c.1629 in the Mauritshuis (The Hague). This discovery prompted the author to undertake a limited survey into a selection of early paintings by Rembrandt and his close circle that revealed a wealth of hitherto unrecorded information acquired from beneath the visible paint layers of the paintings. This paper demonstrates the relevance of the IRR technique in the discovery not only of underdrawings but also how underpaintings and sketches can be visualised. Instigating a comprehensive search for Rembrandt's underdrawing – in the widest sense of the word – in his early works may add significant new information to the corpus of the artist and his contemporaries.

Introduction

The Rembrandt Research Project (RRP), established in the Netherlands, commenced its research in 1968. The final and sixth volume in the series produced as an outcome from this research, *A Corpus of Rembrandt Paintings VI. Rembrandt's Paintings Revisited: A Complete Survey*, was published in 2014.¹ The completion of such a large corpus of documentary evidence (over 4600 pages) on a single artist, his techniques and painterly approaches constitutes a unique resource for scholarly research. This wide-ranging work offers detailed narratives on each painting illustrated with black and white images and, later on, colour photographs, accompanied by abundant technical observations and images. This vast collection of information on Rembrandt's paintings has engendered much debate in the scholarly community and new interpretations of the results

will surely continue in the future as scholarship progresses. Importantly, considerations as to what might be accomplished in the future to complement and test the results obtained by the RRP will certainly be pursued using new ways of looking at the subject and the application of more up-to-date technologies. At the same time, scrutiny of Rembrandt's paintings will continue to yield new information on his individual painterly methods and habits. However, only by an equally close examination of the work of Rembrandt's circle can the differences or similarities in technique and painterly approach be fully evaluated and eventually the distinction of one painter over another more clearly understood.

Rembrandt was a successful and popular teacher with more than 50 documented students, all of whom he would have taught to draw in his style.² Between them they produced thousands of drawings and it is understandable that even early on

Table 1 The occurrence of references to IR photography compared with IRR in the individual volumes of *A Corpus of Rembrandt Paintings*.

<i>Corpus</i> volume	IR photo	IRR	Year of publication
I	41	1	1982
II	35	4	1986
III	44	3	1989
IV	46	30	2005
V	57	29	2011
VI	13*	16*	2014

* The count refers to the chapter entitled 'Notes to the Plates', pp. 480–687

there was confusion as to their authorship. This is particularly true of Ferdinand Bol, who worked in a Rembrandtesque style during the 1640s and could emulate the master's 'handwriting' and shorthand drawing style most convincingly when sketching on paper with ink and brush.³ While recognising Rembrandt's mastery in drawing and etching, the study of his 'ductus' will continue to occupy scholars as will the search to examine and record the very first brushstrokes – some of which may be defined as underdrawing – that Rembrandt may have applied to an otherwise completely empty and blank, untouched primed panel or canvas.

Rembrandt and infrared imaging research from 1982 to 2014

It had long been assumed that it was unlikely that Rembrandt began a painting by first making a compositional drawing to serve as a guide for the successive paint applications that would finally cover the drawing completely. This procedure was, however, considered standard practice among painters and therefore common in both the earlier generation of artists and among many of Rembrandt's contemporaries. The compilers of treatises on painting techniques such as Karel van Mander,⁴ Sir Theodore Turquet de Mayerne⁵ and later Rembrandt's pupil Samuel van Hoogstraten (1627–1678)⁶ and his pupil Arnold van Houbraken (1660–1719) all discuss the central importance of drawing.⁷ It is surely the case

that most painters who had been taught that drawing is '*den Vader van t'schilderen*' (the progenitor of painting)⁸ would approach the empty primed canvas or panel with a piece of charcoal, an oil crayon, pencil, stylus or simply a pointed brush in order to set down the first ideas of the composition. We now regard a compositional drawing made in one of these media or the initial design achieved during the act of painting and covered by overlying layers as an 'underdrawing'. This preliminary 'drawing', whether in a dry or liquid medium, can be made visible under certain circumstances and recorded by an imaging instrument operating in the 'invisible' near infrared spectrum. Infrared (IR) photography using film was in use as early as the 1950s for the examination of so-called Early Netherlandish paintings, but in the 1960s the technique was greatly improved by the research of J.R.J. van Asperen de Boer from 1968,⁹ who elaborated the work later in his thesis: *Infrared Reflectography: A Contribution to the Examination of Earlier European Paintings*. From 1970, use of the newer IR examination technique dramatically improved the study of paintings.¹⁰ Van Asperen de Boer employed an IR vidicon system sensitive up to a wavelength of 2000 nm and therefore more capable of penetrating the paint than IR photography, which recorded radiation in the wavelength range of approximately 700–900 nm. Despite this ground-breaking work and the fact that infrared reflectography (IRR) could often be employed to investigate whether or not the use of an underdrawing was part of a painter's practice, the IRR technique was not employed by the RRP research team. While it became common for paintings by artists from the fourteenth to the sixteenth century to be documented using IRR, with very revealing results, it was not used to examine the work of artists such as Rembrandt and his circle until many decades later.

The preface to the first volume of the *Corpus* (1982) includes the statement that IR photographs are a good deal less informative than X-radiographs. It was acknowledged, however, that IR photographs occasionally 'throw light in a surprising way on how paint was applied, but where the preparatory stage of the painting process is concerned the absence of any underlying drawing in an absorbent material (like that used by the Early Netherlandish painters) means that in Rembrandt's case infrared photographs do not leave us much the wiser'.¹¹

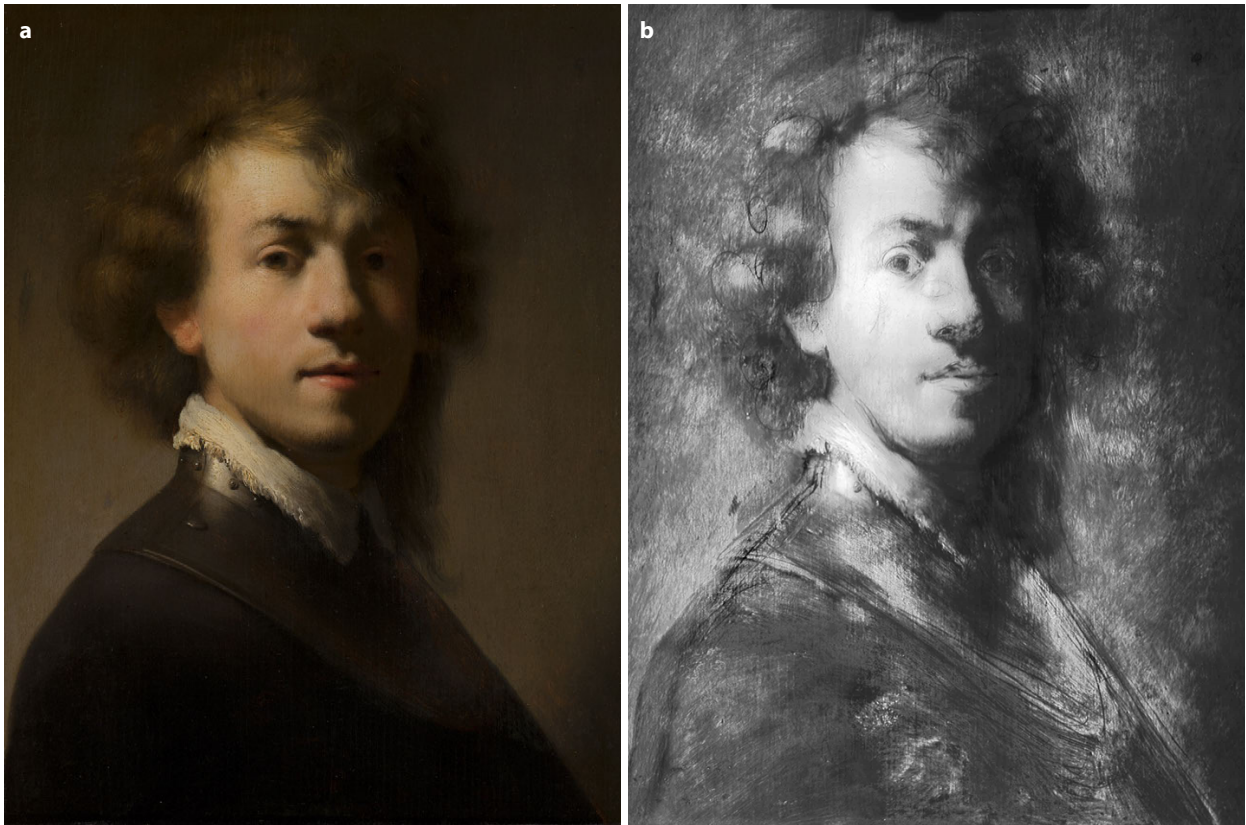


Figure 1 (a) Rembrandt (studio copy), *Portrait of Rembrandt (1606–1669) with a Gorget*, after c.1629, oil on panel, 37.9 × 28.920 cm, Mauritshuis, The Hague, inv. no. 148. (b) Computer montage of the infrared reflectogram of the painting. Photo courtesy of A. Verburg/RKD.

A tally of the use of IR photography compared to IR reflectography and reflectograms reveals an interesting trend in which references to IR photography remain fairly stable over the years, with an average of 45 references per volume, while IRR documents show a tendency to increase (Table 1).

Although IRR is cited up to four times in Volumes I–III, Volumes IV–V show an abrupt increase to around 30 references per volume.¹² Although still not referred to as frequently as IR photography, in Volume IV from 2005, which appeared 35 years after Van Asperen de Boer first demonstrated and established IRR, there is a significant rise in references to IRR as a tool for examining Rembrandt's work. It is only by Volume VI of the *Corpus* that the use of IRR just about outweighs IR photography as a means of investigation. There is some ambiguity as to the definition of the term in the texts, confirmed by the fact that the term 'infrared reflectography/reflectogram' does not appear in the Glossary of Volume VI, the final work in the series. In this volume, the method of examination in the near IR is referred to by the statement: '*pentimenti* and underdrawing

containing black show particularly clearly in an infrared photograph'.¹³

Rembrandt and underdrawing

The first volume of the *Corpus* quotes Hubert von Sonnenburg's conclusions from his 1969 survey of the state of knowledge on technical aspects of Rembrandt's paintings, maintaining that nothing is known either from sources or examination of any kind about underdrawing used by Rembrandt on his primed panels or canvases. The *Corpus* authors note that Von Sonnenburg then suggested, on the basis of the painting materials and tools depicted in Aert de Gelder's *Self-Portrait as Zeuxis* (Frankfurt, Städel Museum) dating from 1685, that de Gelder (and therefore, perhaps, also his teacher Rembrandt) used white chalk to lay-in the composition on his coloured ground.¹⁴ They remarked, however, that even if Rembrandt employed white chalk for preliminary sketching on the relatively dark grounds he used in his later work, doing so on the lighter grounds of his

early panels would not make sense from a practical point of view. But, as they mention, ‘no trace has been found in Rembrandt’s Leiden panels of a dark underdrawing of the kind that can be seen not only in Rubens’ paintings on panels with a light ground, but also in at least one Lastman painting,’ the latter having been examined by IRR.¹⁵

In the first volume of the *Corpus*, the authors state that they concur with the speculation made by the art historian and restorer Johannes (Hans) Hell (1897–1974),¹⁶ summarising his hypothesis as follows: ‘Rembrandt would have done as a rule his first lay-in with a brush, using brown paint of greater or lesser translucency, not only for drawing lines but also for applying a tone over largish areas (in the way a wash drawing is done).’ In agreement with Hell’s conclusions, their own observations were that ‘So far as the eye can tell, they [the underdrawing and tonal layers] invariably lie directly over the light ground.’¹⁷ The statement was published in 1982 and the two succeeding volumes of the *Corpus* from 1986 and 1989 build on this assumption. It can be imagined, therefore, that it came as a considerable surprise to the world of Rembrandt scholarship in 1998 when it was discovered that below the paint of what was then considered to be a self-portrait by Rembrandt, *Portrait of Rembrandt with a Gorget* after 1629 (The Hague, Mauritshuis, inv. no. 148), was a very detailed underdrawing, made visible with a CCD camera operating in the near IR region (Fig. 1).¹⁸

The introduction of IRR to Rembrandt research

The discovery of an underdrawing below the smooth paint surface of the Mauritshuis painting prompted an urgent comparison and physical confrontation with the early self-portrait in Nuremberg (Germanisches Nationalmuseum), which were placed side by side for the first time and the results of the assessment published subsequently in *Oud Holland* in 2000 (Fig. 2).¹⁹ This direct comparison resulted in serious doubts as to the authenticity of the Mauritshuis work (now labelled ‘Rembrandt van Rijn (studio copy), *Portrait of Rembrandt (1606–1669) with a Gorget*, after c. 1629’) because the notion of an underdrawing was thought to be completely inconsistent with

Rembrandt’s working method. It should be noted that earlier, the German art historian Claus Grimm had questioned the chronology of the two paintings also based on close examination and X-radiograph images of each work.²⁰

The care and detail with which the facial features were drawn in the Mauritshuis *Portrait of Rembrandt with a Gorget* recalls the long-established assessment of the act of drawing as being ‘den Vader van t’schilderen.’²¹ For centuries, apprentice painters had been required to practise drawing faces, hands, feet and draperies, sometimes for years, before graduating to painting,²² whether they were working in Italy, Germany or the Netherlands.²³ These drawings were often made on erasable *tavolette*,²⁴ therefore the great majority would have been lost. This makes it difficult to identify any established artist through his early development as a draughtsman. Van Mander stressed in his *Schilderboeck* that only the most skilled artists could apply a ‘dead-colouring’ directly to the support without any indication of an initial composition. The more inexperienced painter would have to invest much time sketching the scene painstakingly in charcoal and then drawing the outlines in meticulous detail with silverpoint before starting to paint.²⁵ With the discovery of the underdrawing in the Mauritshuis *Portrait of Rembrandt with a Gorget*, which must have been executed in Rembrandt’s studio, the notion must be considered of drawing, making cartoons and transferring these to the panel or canvas before wetting a brush in oil paint.

In the later 1990s, prompted by the detection of the underdrawing in the *Portrait of Rembrandt with a Gorget*, the present author began examining a number of early Rembrandt paintings systematically using IRR analysis for the first time. This project also included paintings formerly attributed to Rembrandt and works by Jan Lievens, Gerrit Dou and Isaac de Jouderville – 59 works in total.²⁶ Although very little underdrawing in a dry medium was detected during this project, a more important finding was that Rembrandt’s virtuoso application and use of an undermodelling in paint – as described by Hell above – can actually be detected in the IRR image. By this means we had gained a completely new source of significant information on the initial application of paint. IRR analysis also revealed that the shaded parts of the face in Rembrandt ‘heads’ from 1626

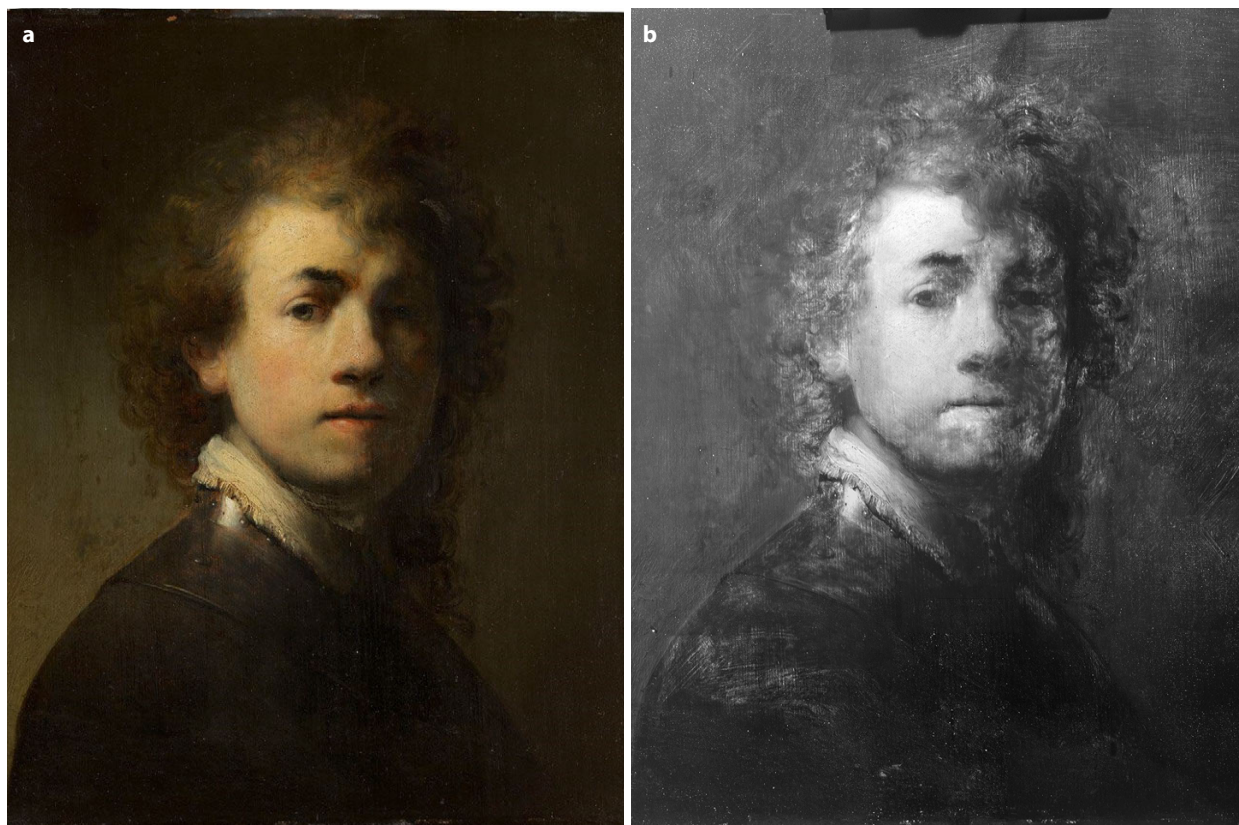


Figure 2 (a) Rembrandt, *Self-Portrait with Gorget*, 1629, oil on panel, 38.2 × 31 cm. Germanisches Nationalmuseum, Nuremberg, inv. no. Gm391. (b) Computer montage of the infrared reflectogram of the painting. Photo courtesy of A. Verburg/RKD.

to 1634 (the main period of this first study) have a characteristic patchy appearance. Since this feature is absent from portraits painted by Lievens, Dou, De Jouderville and other artists close to Rembrandt, we believe that we have uncovered an important marker for the identification of Rembrandt's autograph painting technique, that is, a characteristic that enables us to distinguish Rembrandt's method from that of his early contemporaries.

IR photography for the study of paintings is now largely obsolete having been replaced by the more advanced techniques of CCD imaging and cameras using InGaAs array sensors. In recent decades, these have also demonstrated their importance for the general study of seventeenth–nineteenth-century paintings.²⁷ However, it is the potential for documenting seventeenth-century paintings by Rembrandt and his circle that has yet to be fully appreciated through a structured compilation of comparable documentation by IR imaging which will be made available through, for example, the RKD's growing online Rembrandt Database.²⁸ The possibilities of visualising the initial stages of

Rembrandt's painting process become extremely interesting. The artist would start by delineating the composition in lines of varying thickness directly over the coloured oil ground followed by the application of dead colouring or more extensive undermodelling in monochrome hues ranging from dark (reddish) brown to light ochre hues. Certain areas would be more heavily toned and even some impasto applied; others would be semi-transparent, allowing the lighter ground to shine through. Rembrandt's *Concord of the State* (Rotterdam, Museum Boijmans Van Beuningen), c.1637 (Fig. 3), although made for a different purpose, gives us an impression of an early stage in the painting process before the application of the final paint layers.²⁹ In the earlier *Anatomy Lesson of Dr Nicolaes Tulp*, dated 1632 (The Hague, Mauritshuis), cross-sectional analysis confirmed that Rembrandt applied a brown painted undermodelling at a preliminary stage to define the main form and principal shadows (Fig. 4).³⁰ Scientific analysis has revealed that at this initial stage Rembrandt was probably working with paint bound in an aqueous medium.³¹



Figure 3 Rembrandt, *The Concord of the State*, c.1637, oil on panel, 74.6 × 101 cm, Museum Boijmans Van Beuningen, Rotterdam, acc. no. 1717.

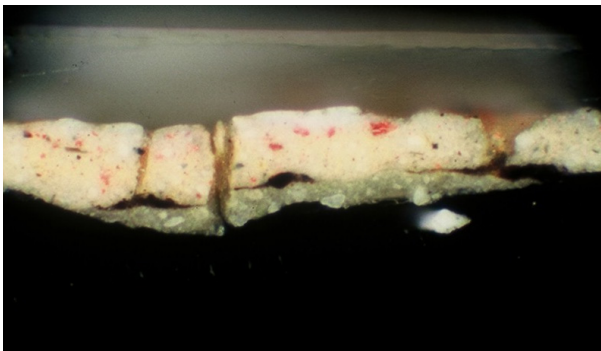


Figure 4 Rembrandt, *The Anatomy Lesson of Dr Nicolaes Tulp*, 1632, oil on canvas, 169.5 × 216.5 cm, Mauritshuis, The Hague. Paint cross-section: at the left can be seen the bright uppermost paint layers of the flesh colour of one of the faces. Below them are pockets of brown paint from the initial painted sketch of the face applied directly over the greyish second ground layer containing lumps of lead white. Missing at the right is the first ground layer in a warm reddish earth colour and the canvas support.

Besides sporadic references in painters' manuals to aqueous 'drawing' media, this would also seem logical: an initial paint layer in such a medium would dry

fairly quickly, enabling the artist to continue in oil without wasting time waiting for an initial oil layer to dry.³² But the use of an aqueous undermodelling has another implication that seems particularly significant to our interpretation of Rembrandt's works: as soon as the aqueous layer was dry, oil paint could be applied directly without 'erasing' the brushstrokes of patchy brownish undermodelling. Therefore the artist could apply oil paint and rework the image wet-in-wet directly on the surface without obliterating his 'composition' beneath and, as significant, without contaminating successive paint by the brownish undermodelling that was now dry. This further explains why IRR reveals the undermodelling so clearly.

IRR examination offers a new means of appreciating Rembrandt's artistic idiosyncrasies and working habits such as, for example, his manner of recording the bluish hue of the white in a sitter's eye. It was appreciated by painters that white paint with a small admixture of vine black provides exactly



Figure 5 (a) Rembrandt, *Portrait of Haesje Jacobsdr van Cleyburg*, 1634, oil on panel, 68.6 × 53.4 cm, Rijksmuseum, Amsterdam, inv. no. SK-A-4833; (b) detail and (c) infrared reflectogram of (b). Photo courtesy of A. Verburg/RKD.

this naturalistic bluish haze in the human eye and this technique has been recorded many times in Rembrandt's portraits and 'tronies' of the 1630s. One example can be seen in the *Portrait of Haesje Jacobsdr van Cleyburg* 1634 (Amsterdam, Rijksmuseum) in which the white of the sitter's eyes show up as dark in IRR due to the incorporation of black pigment with the lead white (Fig. 5).³³ To a lesser degree the same applies to Rembrandt's *Young Woman in Fantasy Costume* 1633 (Amsterdam, Rijksmuseum)³⁴ as well as in his *Self-Portrait with a Velvet Beret and Gold Chain* 1633–36 (Berlin, Gemäldegalerie, Staatliche Museen zu Berlin).³⁵

As indicated above, at the turn of the twentieth century the RRP introduced examination using IRR images in their evaluations, and in Volume V of the *Corpus* (2011) the interpretation of an IRR image was crucial in providing evidence for the reattribution of the *Parable of the Labourers in the Vineyard* 1637 (St Petersburg, State Hermitage Museum). The painting was reattributed to a work by Rembrandt for several reasons, among which were that certain details are much more clearly seen in the IR reflectograms than

in the painting in its present condition.³⁶ It was noted that the details lie on the painted surface of the picture and should not therefore be regarded as possible underdrawings. However, the characteristic way these details are drawn, especially in the group of the four labourers, suggests Rembrandt's own hand. The IRR image demonstrates his careful description of detail and is comparable to his etchings from the same period, which exhibit a similar style of closely observed draughtsmanship.³⁷

Rembrandt's method corresponds to Van Mander's description of bold and inventive painters who 'without great trouble would work directly with brush and paint in a free approach and thus set down their paintings deftly in the dead-colour; they sometimes "re-dead-colour" soon after, so as to achieve a better composition. Thus those who are abundantly inventive go audaciously to work, thereafter making an improvement here and there.'³⁸ We have established that IRR reveals very effectively the mottled, patchy undermodelling or dead and 're-dead' colour' that was commonly used below the paint application of Rembrandt's paintings.



Figure 6 (a) Carel Fabritius, *Hagar and the Angel*, c.1645, oil on canvas, 157.5 × 136 cm, The Leiden Collection, New York; (b) IRR detail of the angel's head and halo, centre right; (c) IRR detail of Hagar's foot, bottom right. Photos (b) and (c): Jørgen Wadum.

Rembrandt's pupils as exemplars of technique

As well as defining Rembrandt's technique, a survey of his pupils' works with IRR imaging may reveal how the master's methods were emulated by his followers, and the way in which his teaching and practice would have found its way into their painting vocabulary when faced with the task of creating a picture. As an example, *The Toilet of Bathsheba* 1643 (New York, The Metropolitan Museum of Art) by one of his pupil's (with intervention by Rembrandt himself) is recorded as showing underdrawing using a brush near the edge of the cliff face when viewed using IRR.³⁹ While the pupil's name is not known for certain, IRR examination of a large number of paintings by Gerrit Dou, Rembrandt's first pupil for almost four years, revealed an extensive use of underdrawing and undermodelling.⁴⁰ The use of underdrawings in works by Dou is more the rule than the exception. During the next stage he would lay down broad brushstrokes of a semi-translucent undermodelling in brown tones, resembling Rembrandt's style, which

he must have adopted while working in his master's studio. The surface film (i.e. the visible paint layer) by contrast reveals only Dou's preference for highly wrought detail and the rendering of idealised images that are almost super-naturalistic compared to the rough paint application of Rembrandt and that of many of his followers.

Carel Fabritius worked briefly in Rembrandt's studio between 1642 and 1643 and some of his early ambitious history pieces – such as *The Raising of Lazarus* c.1643–45 (Warsaw, Muzeum Narodowe in Warszawie)⁴¹ and *Hagar and the Angel* c.1645 (New York, The Leiden Collection)⁴² – exhibit blunt and rough brushstrokes.⁴³ Recent literature suggests that the sparsely populated Middenbeemster, where Fabritius is recorded in 1643, would not have afforded him sufficient clientele, and it is probable that Fabritius travelled back and forth to Amsterdam periodically until 1650.⁴⁴ Some years ago Werner Sumowski (1931–2015) recognised Fabritius' style as 'alternating between the Rembrandtesque and his own manner'.⁴⁵ Indeed, Fabritius could be said to be indebted to his master in his earliest paintings,

however, fairly early on he developed his own unique and characteristic style of brushwork. A stylised handling of the brush, combined with a certain rapid linear as well as rounded dabbing of the paint, begins to occur regularly in his paintings from early on in the artist's development. We might ask whether, like Rembrandt, Fabritius started out on his oil grounds by setting down the composition in darker and lighter lines, followed by the application of the dead colouring (undermodelling) in monochrome brownish hues.⁴⁶ As noted earlier with the aid of IRR imaging of a selection of paintings by Rembrandt and Gerrit Dou, a highly individual and somewhat Rembrandtesque lay-in was discovered in the undermodelling. Similarly, using IRR, the characteristics of Fabritius' brushwork in the initial stages of his painting process was researched and again 'invisible' underlying brushwork was found that set the scene for his compositions. In *Hagar and the Angel* (Fig. 6a) the large halo of the angel in IR reveals blunt broad semicircular lines applied sketchily with a round-tipped brush (Fig. 6b). Below Hagar's left foot we encounter fascinating curly lines forming the contours for the large coiled leaves of the butterbur plant. However, most characteristic are the bluntly applied indications of form around Hagar's left foot (Fig. 6c). The dark brushed lines were applied with vigour and yet the brush was skipping over the canvas before the final paint layers covered these underlying features – only to be revealed once more by IRR imaging.

Discussion

Rembrandt's early apprentices Dou and Fabritius sketched their compositions with charcoal, pencil or a pointed brush on the primed wood panel or canvas. Rembrandt's teacher Pieter Lastman also adopted this technique, which calls to mind the observation by J. Müller-Hofstede and P. Schatborn that some of Rembrandt's drawn compositions were apparently first designed on paper as thin contour lines, and that the next step was to apply a wash using the brush in order to create shape and volume in the scene.⁴⁷ In the very elaborate yet sketchy painting *The Concord of the State* (Fig. 3), the composition was first indicated by faint drawn lines. These lines, however, are painted alternately with lighter or darker paint and

therefore differ from an underdrawing executed in a drawing material such as black chalk for example. During the investigation of Rembrandt's *Andromeda* (The Hague, Mauritshuis), painted c.1630,⁴⁸ IRR examination revealed thin curved lines probably made using a pencil (Fig. 7). Apparently just a few thin lines position the figure directly on the white ground of the wood panel. Does this underdrawn sketch indicate that Rembrandt also occasionally devised his composition with a few drawn lines emulating the way he may have taught his pupils?

Until now this small early work from Rembrandt's Leiden period seems to be accompanied by another two in which a sketchy underdrawing has been detected. An example of this practice is perhaps to be found in the contours of the iris in the sitter's eyes as well as in the left eyebrow in Rembrandt's *Half-length Portrait of a Woman with a Beret* (formerly identified as Saskia) 1643 (Berlin, Gemäldegalerie, Staatliche Museen zu Berlin), which seems to be drawn prior to painting (Fig. 8).⁴⁹ Furthermore, in Rembrandt's *Self-Portrait* of 1658 (New York, The Frick Collection), Volume IV of the *Corpus* mentions having identified lines that: 'If they are lines, they might be shading, which could indicate a type of underdrawing not previously encountered in paintings by Rembrandt.'⁵⁰ In 2021 a long-lost Rembrandt painting was found in Italy depicting the *Adoration of the Magi*.⁵¹ However, the extensive and very detailed underdrawing documented in this painting, which is thought to be the original version, when compared to other versions of this composition, is entirely alien to Rembrandt's working practice. It should be noted that the St Petersburg painting of the *Adoration of the Magi* has, since 2011, been fully reinstated in Rembrandt's oeuvre as the prototype, something that should have eliminated any further speculation on a 'lost original' by Rembrandt.⁵²

Based on our IRR research, we have demonstrated that the young Rembrandt was already adept at using locally applied brown undermodelling to suggest depth in his compositions. The brown layer applied transparently over an off-white, yellowish ground often produces a warm, reddish glow simulating the reflection of light from an illuminated area adjacent to one in shadow. It is now apparent that IRR also provides information on the build-up of paint layers thereby increasing the imaging technique's power to reveal the genesis of paintings. The less commonly

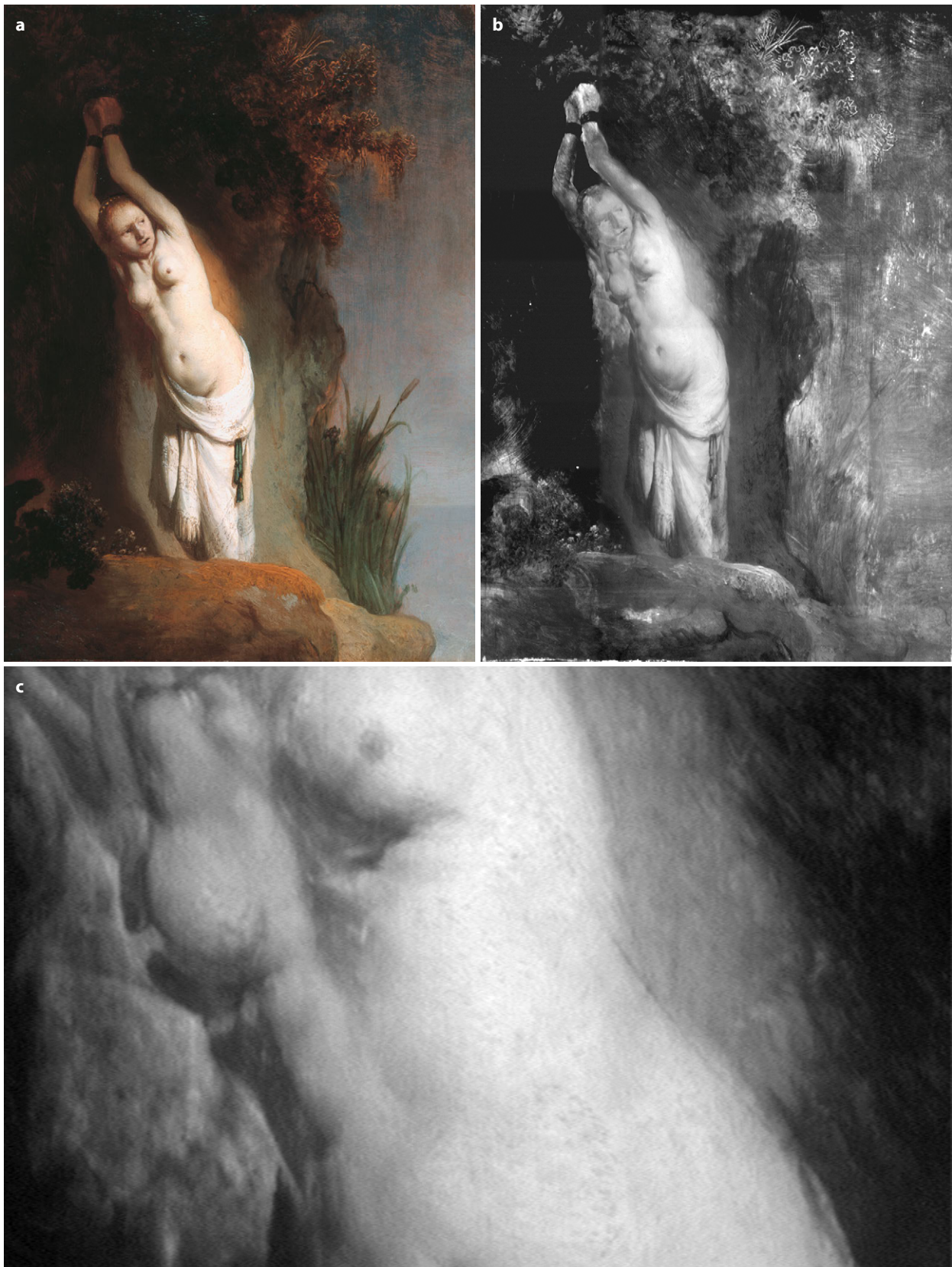


Figure 7 (a) Rembrandt, *Andromeda*, c.1630, oil on panel, 34 × 24.5 cm, Mauritshuis, The Hague, inv. no. 707; (b) infrared reflectogram of (a); (c) detail of (b). Photos (b) and (c): Jørgen Wadum

applied but advanced technique of searching for Rembrandt's underdrawing using neutron autoradiography, which was initiated some decades ago at the Metropolitan Museum of Art in New York,⁵³ has been revised more recently at the Gemäldegalerie, Staatliche Museen zu Berlin.⁵⁴ One of their more recent examinations was of Rembrandt's *Susanna and the Elders* painted in 1636.⁵⁵ The neutron autoradiography study revealed indications of delineation for the figures in the composition and in the final autoradiograph the distribution of phosphorus arising from bone black in the underdrawing was recorded. Among other compositional changes it is possible to observe the arm of the man behind Susanna reaching down towards her left arm. The same working procedure also seems to have been used in Rembrandt's much later painting from c.1659–60 depicting *Jacob Wrestling with the Angel* (Berlin, Gemäldegalerie, Staatliche Museen zu Berlin).⁵⁶ In his first sketch Rembrandt positioned the angel's hand at the level of Jacob's shoulder; by subsequently moving it up he transformed the struggle into an embrace.⁵⁷

In the sixth and final volume of the *Corpus*, however, it is interesting to note that a recent reattribution of a painting to Rembrandt, *Lighting Study with Hendrickje Stoffels in a Silk Gown as a Model* c.1659 (Frankfurt, Städelsches Kunstinstitut)⁵⁸ repeats the assertion that Rembrandt did not use black chalk or other drawing materials for his underdrawings but that he habitually sketched his composition with a brush from early in his career. In the IRR image of this portrait, the author states that 'traces of free, broad brushstrokes are visible which sometimes (but not always) correspond with the visible surface image. Such lines, which are sometimes straight and do not always correlate with the folds on the surface of the present painting, evidently belong to the first design.'⁵⁹ This idea confirms our recent research and observations on Rembrandt's work and that IRR imaging may be able to provide a wealth of new information on the initial stages of Rembrandt's painting method.

Conclusions

Future studies will show whether the use of linear compositional drawings, in a dry or fluid medium, actually occurs more often in Rembrandt's works



Figure 8 Rembrandt, *Half-length Portrait of a Woman with a Beret*, 1643, oil on panel, 75 × 60 cm, Gemäldegalerie, Staatliche Museen zu Berlin, Berlin, inv. no. I.905: infrared reflectogram detail. Photo © C. Schmidt, SMB (CC BY-NC-SA by copyright: Gemäldegalerie, Staatliche Museen zu Berlin).

than we have indicated here. As well as Lastman, Dou and Fabritius, other artists from Rembrandt's immediate ambit must have made use of an initial underdrawing. Although Rembrandt's paintings have been documented with exemplary comprehensiveness by the RRP and other researchers, new or improved methods of research – including extensive IRR documentation – will lead to the discovery of previously unrecorded information on his painterly procedures. This will help us not only to better understand Rembrandt's technique but also those of his contemporaries, leading to a greater appreciation of his genius. A comparative analysis of the early copies made by his students and assistants within the Rembrandt workshop after prototypes by the master (the so-called 'satellite pictures') would be a logical continuation of this IRR research. There is no doubt that the RKD Rembrandt Database will play a significant role in elucidating wider evidence of material uses and artists' choices as well as a greater understanding of the working methods employed.

It would be unrealistic, however, to expect that we will ever be able to discover the complete truth with regard to the painting techniques of the seventeenth century, but if we are as persistent in our search as Andromeda's eternal lookout for the absent Perseus in Rembrandt's small Mauritshuis panel, then we may reach a much closer understanding of the details of the artistic creativity of Rembrandt and his contemporaries.

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 31. Proteinaceous material was found in *The Concord of the State*, Museum Boijmans Van Beuningen, Rotterdam and in Rembrandt and/or studio, *Tronie of an Old Man*, Mauritshuis, The Hague, inv. no. 565 by K. Groen; protein was also detected in Workshop of Rembrandt, *Holy Family at Night*, Rijksmuseum, Amsterdam, inv. no. SK-A-4119 (A. Wallert, pers. comm., 1999). See also Van de Wetering 1997 (cited in note 22) 27.
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