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# Monet's 'Bathers at La Grenouillère'

Michael Wilson, Martin Wyld and Ashok Roy

## From plein-air to Impressionism: Monet at La Grenouillère

Michael Wilson

The National Gallery Collection includes important pictures by Monet, Pissarro and Renoir, but for the most part they are untypical of Impressionist painting. Some, like Pissarro's *View from Louveciennes* (No. 3265) and Monet's *Beach at Trouville* (No. 3951), are early works, excellent of their kind but relatively subdued in colour; others like Monet's *Waterlilies* (No. 6343) were painted long after the heyday of Impressionism. The bequest by Mrs Walzer in 1979 of *Bathers at La Grenouillère* (Plate 1, p.25 and Fig.5) [1] which in spite of its early date, 1869, epitomizes in its subject and treatment so much of Impressionist painting, has gone far in filling this gap. But it is also of major significance in a wider context and precisely on account of its date, for it was in the pictures painted at La Grenouillère in the summer of 1869 (including the National Gallery work) that Monet reached a new point of discovery, evolving the technique which was to serve for the translation of the contemporary world into paint for the next decade and beyond. *Bathers at La Grenouillère* has the crude vigour of a seminal work, and conveys the excitement of discovery, of a major artist breaking new ground.

During the summer of 1869 Monet was living with his mistress and young son in conditions of extreme hardship at Saint-Michel, a hamlet near Bougival, close to the Seine, west of Paris. His work had been rejected by the Salon, the financial assistance offered by his patron Gaudibert of Le Havre was exhausted, and he had no money to buy food, let alone paints. Bazille occasionally sent him money and canvases and Renoir, who in August and September was staying in the vicinity with his parents, brought scraps from the family table. Yet in spite of these difficult circumstances Monet continued to paint. On 25 September he wrote to Bazille, 'J'ai bien un rêve, un tableau, les baigneurs de La Grenouillère pour lequel j'ai fait quelques mauvaises pochades, mais c'est un rêve. Renoir, qui vient de passer deux mois ici, veut faire aussi cet tableau [2].' Monet did paint his 'tableau'. A picture of the popular bathing and boating place of La Grenouillère on the Seine near Bougival was one of his two entries that were rejected at the Salon of 1870 [3], and is probably the painting formerly in a German collection, now lost and known only from a photograph (Fig.1) [4]. The 'bad sketches' to which he refers must be the painting now in the Metropolitan Museum, New York (Fig.2) and the recent acquisition of the National Gallery. From photographs, one can

see that the final composition was more finished in treatment and, to judge from the scale of brushstrokes, larger in size. Wider in format than the two sketches, it combined elements from both and introduced new details such as the sailing boats and the crowd of fashionable visitors on the tiny island, the Pot à Fleurs or Camembert, midway between the floating café and the shore of the île de Croissy [5].

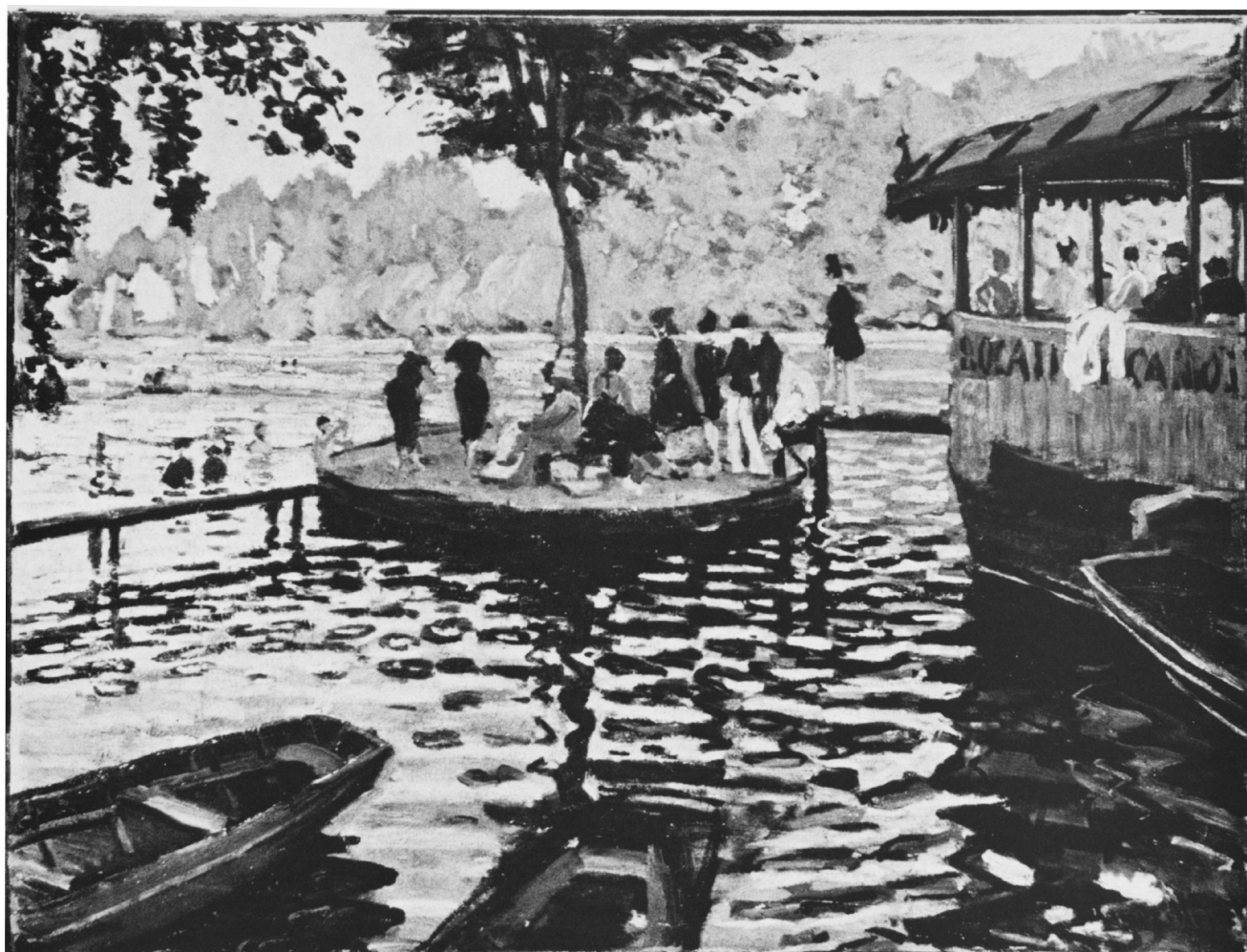
It is astonishing that the artist should have considered his sketches bad. It may simply be a case of casual self-deprecation or a passing acknowledgement of the difficult task he had set himself. Whichever, it is a clear indication that Monet still recognized a distinction between an open-air sketch done on the spot, and an elaborated composition produced for exhibition. Working in the open, *sur le motif*, was habitual practice for Monet by 1869, but he was still thinking in terms of a major composition as a means to achieve success at the Salon and cement his reputation. In comparison with the large *Women in a Garden* of 1866 (Jeu de Paume, Paris) and the *Terrace at Saint-Adresse* of 1867 (Metropolitan Museum of Art, New York) the two La Grenouillère sketches are crude and hurried. They are also vigorous, brilliantly atmospheric, and much more effective as renditions of the everyday scene. The artist has made a great effort to set down all that he observes without tidying it up or posing the figures. Although in September 1869 he does not seem to have been aware of it, Monet had made a radical break-through. *Bathers at La Grenouillère* marks the achievement of a new mode of painting which in the next decade Monet and a handful of others were to champion in the face of determined opposition by the art establishment; that is, working entirely in front of the motif to produce works that are finished, not in the conventional sense, but as complete, self-contained statements of observation.

The riverside resort of La Grenouillère was for Monet a fortuitous choice of subject. With the bustle of bathers, boaters and gaudily dressed visitors to the floating café, and the play of light on the agitated river and through the huge trees of the île de Croissy it was by no means an easy subject, but it provided a portrait of contemporary society at play vivid enough to test to the utmost the artist's responsiveness to the particular flavour of modern life. Such critics as Baudelaire and the Goncourts were calling out for a serious and truthful approach to contemporary themes in painting, but with the notable exception of Manet, no-one had responded. Monet and Renoir, however, were well-suited to the task. Unintellectual and thoroughly bourgeois, they could respond to the character of contemporary life and record it without distortion or criticism. Maupassant later described La Grenouillère





**Figure 1** Claude Monet, *La Grenouillère*, present whereabouts unknown.



**Figure 2** Claude Monet, *La Grenouillère*, canvas,  $29\frac{3}{8} \times 39\frac{1}{4}$  (75 × 100). Metropolitan Museum, New York.





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in *La Femme de Paul* and *Yvette* as a vulgar resort of drunks and prostitutes. The image he gives of a teeming holiday crowd thronging the banks and the café is the verbal equivalent of Monet and Renoir's pictures, but it is shot through with disgust and indignation at the stupidity and vanity of the low class revellers. 'At the approaches to La Grenouillère a crowd of people were strolling beneath the gigantic trees which make this corner of the island the most delightful park in the world. Women, flaxen-haired girls with large breasts and buttocks, faces thick with make-up, eyes heavily-shadowed and lips scarlet with lipstick, laced and strapped into fantastic dresses, trailed across the fresh grass their skirts in execrable taste, while beside them strutted young men, looking like models in a fashion-plate with their pale gloves, patent leather boots and thin canes and monocles which only emphasised the fatuousness of their smiles.' (*La Femme de Paul*) [6].

It is unlikely that in spite of the interval of time, the place had radically changed, but the writer judges where the painter does not, and, with an eye to irony, contrasts the beauty of the place with the sordidness of the activity. In spite of their personal hardship, Monet and Renoir in their respective paintings record, on the contrary, a picture of untainted gaiety. As members of the bourgeoisie it perhaps did not occur to them to criticize the vulgar behaviour, and in Renoir's pictures in particular (Reinhart Collection, Winterthur; National Museum, Stockholm (Fig.3); and The Hermitage, Leningrad) the holidaymakers are observed with affection and delight.

Similar though their pictures are, often painted from the same vantage-point, Monet and Renoir are ultimately, however, attracted by different things. Renoir is absorbed by people and they dominate the setting. It is a feature that grows more marked still in the 1870s, in for example the *Ball at the Moulin de la Galette* (Jeu de Paume, Paris). Monet on the other hand comprehends the whole scene, and people form only an aspect of it. And it is a characteristic of his art that the painter can be more discreet than the writer without any loss of subtlety; Monet's picture is a masterpiece of suggestion. It takes in the full range of the busy scene — the dispersed activity of the strollers and bathers, the jumble of boats, the broken sunlight and dazzling reflections — and evokes the movement, warmth and noise that paint cannot depict. Practically for the first time, the *plein-air* sketch ceases to be merely the vehicle of appearances and creates a comprehensive impression of everyday activity.

In spite of the awesome challenge of La Grenouillère as a subject, Monet was not daunted. Through almost a decade's practice as an open-air painter he was attuned to the difficulties of recording appearances accurately — creating an illusion of reality — while retaining an overall pictorial coherence; in other words, of making sense in terms of paint of the gamut

of activity, light and movement that a given scene presents. He resolved these difficulties actually through the process of observing and painting in the open. There is no lack of evidence to show that *Bathers at La Grenouillère* was painted in haste out-of-doors. Close inspection reveals that parts of the picture have been hurriedly changed. There are some areas of impasto below the top paint layer which do not relate to anything on the surface, most obviously left of the patch of sky, and it may be that being short of cash and materials, Monet was working on a used canvas. But in the lower part of the composition ghost images of boats appear, not quite painted out, which suggest that he altered the picture to take account of a change in position of the actual boats he was looking at, that the composition was to a point unpremeditated and he was putting down what he could see as best he could. The brushstrokes are broad and hurriedly applied, and the colours are made up of paints straight from the tube or hastily mixed on the palette (see p.22). The trees too appear unfinished. Although a coloured glaze was applied much later to disguise the fact, the right side of the foliage at the top consists of a flat area of unvariegated grey-green paint.

A further proof that the picture was conceived and executed on the spot is the composition, which for the time is shockingly novel. There are no conventional tricks, such as framing devices to establish recession, or a central point or object of focus. Instead, the horizontal line of the cat-walk dramatically cuts across the middle of the canvas. The vantage point is high and so is the horizon (where it is briefly visible), and over half the canvas is taken up by water and boats. True, the lines of the boats, whether by design or happy chance, lead the eye towards the far bend of the river, but the figures are dispersed and no more care is lavished on them than on anything else. Monet sets up a tension between the illusion of space and depth, and the flat design created by the lines of the cat-walk, the stick-like figures and the boats as seen from above [7].

This sense of a flat pattern, of the surface decoration of the canvas, is enhanced by the paintwork. To record his visual sensations, Monet was obliged to evolve a rapid, sketchy notation. Thick lines of coloured paint crudely mark out the shape of the boats, rather than strictly delineating them; thick, abrupt brushstrokes block in figures, foliage, and the bands of reflection on the river. Over the whole picture the brushwork is of a uniform breadth; differences in texture and scale are neglected, and the paint is of a consistently dense opacity. In his haste, too, Monet uses a small range of strong colours across the whole surface, giving it an unexpected decorative unity. Sunlight breaks through at left and right, on the seated figures near the bathing cabins and the crowd of bathers in the distance, but the central part of the scene is, rather unusually, in shadow. The colour may not be as high-keyed as in his later work, yet by using in this area dense, close-toned mauves, pinks, browns, blues and greys, Monet achieves a vibrancy and luminosity which richly evoke the atmosphere of the river.

By these various means Monet escapes the trap of a

**Figure 3** Auguste Renoir, *La Grenouillère*, canvas, 26 × 31¾ (66 × 81). Nationalmuseum, Stockholm.

**Figure 4** Claude Monet, *Bathers at La Grenouillère* (No.6456). Detail of the figures in the middle distance.

literal transcription, drawing on all the conventional methods of illusionism, linear perspective, modelling through light and shade etc., which can easily freeze and stultify the subject. By dispensing with the illusionistic tricks of naturalism, he achieved a bold, novel way of painting that did not venture to disguise its means and could evoke a more comprehensive image of reality. La Grenouillère as a place played an important part in this discovery. It was the challenge of representing constantly moving water and fragmented reflections that resulted in the use of small, broken brushstrokes of bright colour (Plate 2b, p.25). The technique worked, because it conveyed the brilliance and vibrancy of natural light as well as a suggestion of movement and change. And extended across the canvas, this overall texture of broken brushstrokes gave a pictorial unity. It provided the basis of the new notation which was to be taken up by Renoir, Pissarro, Sisley, Manet and others, and to distinguish the Impressionism of the 1870s. The technique of *Bathers at La Grenouillère* also places a greater emphasis on the importance of the observer. The imperatives of the new method, the rapid application of thick paint in broad strokes, result in abbreviations and distortions, a summary of what the artist sees, not what may in fact physically exist. So Monet's bathers are stick-figures (Fig.4), the briefest of short-hand notations. The human form is broken up by slabs of light and water, disintegrated in the overall vision of river, trees and atmosphere. There is a wittiness in the caricatures of the strutting group on the cat-walk that recalls Daumier, and Monet's own early drawings. But it is not imposed. It arises directly from Monet's visual responsiveness. At the Impressionist exhibition of 1874 the briefly sketched crowds in Monet's view of *The Boulevard des Capucines* shocked critics and public alike [8]. The peremptory treatment of the figures in *Bathers at La Grenouillère* remains shocking. Renoir, in his versions of the subject, is more charmed by the visitors and kinder to them. But once again Monet is breaking new ground. He creates a new, pictorial integration of man and nature, a dynamic one in which not only reflections of light on water and the shimmer of leaves in the sun are subject to change, but so also are people; their appearance, their identity and their experience have to be re-examined and re-interpreted from moment to moment.

The implications of this shift in awareness are very great. Suffice to say that in the La Grenouillère sketches Monet had unwittingly hit upon a more subtle and a more truly 'modern' response to the physical world than Renoir in his delightful and diverting pictures of the scene, or Maupassant in his morally-outraged descriptions. In devoting all his capacities to observing and recording, Monet declines to pass judgment and provides an account which is rich, suggestive and compelling.

## Notes and references

1. WILDENSTEIN, D., *Monet, Vie et Oeuvre*, Vol.1 (Paris 1974), Catalogue 135.
2. WILDENSTEIN, *op. cit.*, Letter 53, p.427. See also pp.42–46 and Letters 49–54, pp.426–7 for an account of the La Grenouillère period.
3. Although rejected, one of Monet's entries was identified as a painting of La Grenouillère by the critic, Jean Ravel in his *Preface au Salon de 1870* published in the *Revue Internationale de L'Art et de la Curiosité*, 15 April 1870, pp.320–23. Reference from WILDENSTEIN, *op. cit.*, p.46.
4. WILDENSTEIN, *op. cit.*, Catalogue 136. Previously illustrated in O. Reuterswärd, *Monet* (Stockholm 1948).
5. La Grenouillère was a popular bathing and boating place with a floating café, situated at the edge of the île de Croissy, on the side of the island facing the left bank of the Seine. In the National Gallery picture Monet has painted the scene from a point on the island looking up-stream in a north-easterly direction. The light comes from behind and it must therefore be afternoon. The viewpoint corresponds almost exactly to that in Renoir's painting in the Reinhart Collection, Winterthur.
6. Translated by Mr Anthony Ray of Eton College. I am very grateful to Mr Ray for providing me with these Maupassant references and translations.
7. See the valuable commentary on the La Grenouillère pictures in ISAACSON, J., *Claude Monet, Observation and Reflection* (Oxford 1978), pp.17–18.
8. See Louis Leroy's review, '*L'exposition des impressionistes*', in *Charivari*, 25 April 1874. Quoted in translation by REWALD, J., in *The History of Impressionism*, 4th revised edition (London 1973), pp.318–24.



## Removal of varnish and overpaint

Martin Wyld

Though much obscured by a thick, discoloured varnish at the time of its bequest to the National Gallery, *Bathers at La Grenouillère* (Fig.5, and Plate 1, p.25) was obviously a characteristic example of the technique Monet employed in the pictures he painted directly from nature. However, even a cursory examination of the picture attracted attention to two seemingly incongruous areas of paint. Firstly, almost the whole area of the sky in the top right corner was painted in a dull, beige colour which contrasted markedly with the vigorous brushstrokes, colour and texture of the remainder of the paint. Nowhere else was there such a large area unbroken by changes of colour and texture or by strong brushstrokes. In the first part of this article Michael Wilson has described Monet's painting procedure and the differences in technique and 'finish' between pictures of the same subject, depending on whether they were painted directly from life or in the studio. Consistency of technique throughout each picture, regardless of how 'finished' it was intended to be, is a common factor in all Monet's painting. The flat and dull character of the beige sky was relieved only by the thicker brushstrokes of the layers under it.

The second incongruous part of *Bathers at La Grenouillère* was less obvious through the yellow

varnish, which it slightly resembled. The trees and foliage above and to the left of the sky were covered with a brownish yellow semi-transparent layer which, in places, became blacker or greener. This layer extended as far as the hut on the left and so covered more than half the top edge, forming an elongated triangular shape. Its effect was to define yet also confuse the spatial relationship between the trees and hanging foliage above and the bank of the island on the left below. Elizabeth Jones [1] in her study of the thirty-six Monets in the Museum of Fine Arts, Boston, has remarked on the absence of glazes in Monet's painting. In common with many contemporaries, Monet used neither toning glazes nor glazes of a single colour. The most striking colour effects are obtained by the use of a single colour applied thickly.

Removal of the surface dirt and varnish was straightforward except on the area covered by the brownish-yellow glaze. Free of dirt and varnish, the beige sky looked more out of place than before (Plate 2a, p.25 and Fig.6). The reflections of the sky in the river were a cold greenish blue, but the sky remained a warm beige except for a thin streak just above the horizon. The glaze over the trees proved to be more soluble than the varnish, which could not be removed separately from the glaze. At this point paint samples were taken by Ashok Roy (see the third part of this article on p.22) in order to establish the status of the beige paint and of the glaze. Meanwhile a small area (c. 3 mm. across) of the beige paint was scraped away



**Figure 5** Claude Monet, *Bathers at La Grenouillère* (No.6456), canvas, 28¾ × 36¼ (73 × 92), signed and dated 1869. After cleaning and restoration.





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from a part of the sky where a thick brushstroke could be seen underneath. The beige paint, which at between 10× and 25× looked very different from the remainder of the picture, was easily removable with a small scalpel. At 25× the blue paint uncovered appeared to be identical with that at the horizon and in the reflections in the water. A fine craquelure was visible, and yellow varnish was lying in the hollows of the small part of the brushstroke uncovered. The beige paint on top had a different, less fine craquelure. This was a strong indication that the blue underlayer had dried, cracked and been varnished before the beige paint was applied. Confirmation was provided by the cross-sections, which clearly showed a layer of pale yellow varnish between the two layers [2]. Further examination of the picture revealed that some feathery green brushstrokes, applied in thin dabs as if in imitation of Corot rather than of Monet, were of the same status as the beige paint. They covered some wide pastose brushstrokes of a cooler, greyer colour, and were partly covered by the soluble glaze over the trees [3].

The scattered pigment particles identified in the cross-sections from the trees left no doubt that the glaze had been applied with the varnish as the final part of the alterations made to the top right corner. The possibility that Monet had returned to this picture some years after 1869, and crudely modified his earlier work, was easily dismissed. Removal of the glaze and of the feathery green dabs presented no problems. The paint underneath was perfectly preserved, and the tree overhanging the sky and along the island bank on the left became greyer and more distinct (Fig.7). The ambiguous relationship between the tree in the background and the triangular-shaped darker foliage which hangs down just to the left of the centre of the picture was resolved by the removal of the glaze. In other pictures of La Grenouillère (see Figs.1–3) foliage hangs down, almost to the water, near the cat-walk. The trunk of the tree from which that foliage grows is presumably the same as in the foreground of Renoir's picture (Fig.3), and would probably have been behind and to the left of Monet as he painted the National Gallery picture. The darker foliage is much closer to his viewpoint, probably near the cat-walk, than it had been made to appear by the glaze.

Monet almost completely covered the white ground of *Bathers at La Grenouillère*. Two thin strips at the bottom edge were left uncovered, but the ground was not visible anywhere else except in the sky and the overhanging foliage next to it. Exposed ground does not necessarily imply that the sky and foliage were unfinished, only that they were not worked over as much as the other parts of the picture such as the boats in the left foreground. This may be because the position of the sky, horizon and background trees remained constant throughout the time Monet

worked on the picture, whereas the boats, figures, reflections and effects of light changed continually.

X-radiographs, infra-red photographs and UV fluorescence were used in the examination of *Bathers at La Grenouillère*, though it was the cross-sections which established the later date of the beige sky and of the toning glaze over the trees. The modifications were to do with the taste and comprehension of the time at which they were made, probably before 1900. Today, the less worked parts of Monet's *plein-air* picture do not appear at all disturbing. Even if they did, no responsible restorer would resort to crude overpainting.

## Notes and references

1. JONES, E.H., *Monet Unveiled: A New Look at Boston's Paintings*, Museum of Fine Arts, Boston (Boston 1977), p.6.
2. The presence of a fairly thick varnish interlayer separating beige overpaint from the original pale blue of the sky was confirmed by its strong UV fluorescence in a cross-sectional sample. The pigment composition of the top paint layer was found to be principally zinc white containing a few fine scattered particles of viridian, vermilion and artificial ultramarine. The characteristic UV fluorescence of the zinc white was also revealed under the microscope, and its use confirmed by X-ray diffraction analysis. In addition to the discontinuous layer structure, the microstructural character of the overpaint proved quite distinct from Monet's original paint. Neither zinc white nor artificial ultramarine were found to have been used by Monet in *Bathers at La Grenouillère* (see pp.22–3).
3. The soluble glaze was found to be a thin layer of tinted varnish containing particles of vermilion and emerald green applied over an unpigmented varnish layer.

**Figure 6** Detail of the top right corner during varnish removal but before any overpaint had been removed. The sky is almost covered by overpaint, and the foliage by a heavy glaze.

**Figure 7** The top right corner after cleaning and removal of overpaint.



## Monet and the nineteenth century palette

Ashok Roy

For anyone interested in the history of the development of artists' materials it is a sad fact that quite few later paintings of the National Gallery Collection become available for technical analysis, the conservation needs of nineteenth century pictures generally being less critical and frequent than those for paintings of greater age. However, the materials of painting and particularly the range of available pigments underwent more profound changes in the first sixty years of the nineteenth century than at any other period in the history of easel painting [1]; clearly then some knowledge of the actual materials in use is of significance.

Of the many reasons for the rapid evolution of the palette during the period, probably the most important were the beginnings of a systematic chemistry in the later years of the eighteenth century and the consolidation of this chemical understanding in the following century. Both France and Germany became particular centres for innovative chemical technology, including the search for and production of new artists' pigments. It is perhaps not surprising that the many new pigments invented by the chemists and colour-makers of France were to be adopted by French painters quite soon after their discovery, especially where the pigment material rectified an obvious shortcoming of the palette.

We have no reason to suppose that Monet had any special interest in retaining traditional painting materials; indeed the 'traditional' palette lacked some of the colour intensity and range which characterize many of his paintings. Consequently the *La Grenouillère* painting of 1869 provides us with a useful paradigm of the nineteenth century palette, in which most of the pigments chosen represent the relatively recent introductions of the nineteenth century colour-maker.

A number of samples were taken from *Bathers at La Grenouillère* at the stage when several small cleaning tests had already been made. As Martin Wyld explains on p.19 the appearance of two areas of the picture — the paint of the sky in the top right corner and a roughly triangular patch of middle distance foliage — seemed to suggest some later alteration of the composition. In both cases the evidence provided by cross-sections and pigment analysis strongly implied the surface layers in question not to be part of Monet's original conception (see p.21 and Notes 2 and 3, p.21). At the same time that samples were taken to investigate possible non-original paint, a further limited series of the brightest touches of colour were selected for identification of the pigments, the range in use at this date being of general interest.

Paint cross-sections are of course ideal for the detection of anomalous features of layer structures such as overpaint or other non-original surface layers, but in a rapidly executed painting such as this, the layer structure of the original does not necessarily reveal a great deal that is meaningful about the artist's work-

ing methods. In all parts of the composition sampled there is a sequential build-up of the paint surface and in consequence a layer structure, but this is a result of rapid working by the artist than the product of conscious design. Although three or four layers of paint may be superimposed, the finished effect is usually achieved by the application of a final opaque layer; a technique fundamentally contrary to the theory of many earlier painting methods.

The introduction of new pigments was not the only change to affect painting practice in the nineteenth century. By 1841 the colour merchants were able to supply their clients with oil paint contained in the first collapsible metal tubes in which pigment and medium were ready mixed [2], a development which must greatly have helped the artist to paint out-of-doors. It is apparent from the cross-sections as well as from the swirls of colour in the paint surface, that the technique was at least partly wet-in-wet with some mixing carried out on the canvas; methods consistent with sketchy and rapid painting in the open.

Elizabeth Jones, former Chief Conservator of Paintings at the Boston Museum of Fine Arts, has noted that in their collection of Monet's paintings, all those which can be dated before 1881 have coloured priming layers on the canvas; usually of light brown, pinkish grey or off-white [3]. This is not the case for the National Gallery *Bathers*, no uniform overall coloured underlayer is employed. The white primed canvas [3] has been used directly without further preparation, in keeping with the conclusion that the picture represents a preliminary 'oil-sketch' for a more complete painting.

As might be expected for manufactured paints, the pigment particle size is usually fairly small, having been either reduced by machine grinding or made as fine particle products by wet precipitation processes. Moreover, the pigment mixtures involved in some of the colours, especially Monet's greens, are fairly complex. The combination of heterogeneous pigment mixtures and small particle size make their identification quite difficult in paint cross-sections without the aid of a microprobe analytical method capable of resolving chemical inhomogeneities at the 1–2  $\mu$  scale. The pigment occurrences summarized below were arrived at by a combination of microscopical examination of paint cross-sections and dispersed samples, microchemical tests, laser microspectral analysis (LMA), and X-ray diffraction analysis (XRD).

### Red

*Vermilion* (red mercuric sulphide, probably synthetic, HgS), used virtually pure for the brilliant red flowers at the left edge; identified microscopically and spectrographically (see Plate 3a, p.25). Particles of vermilion are also present in mixture with other pigments, for example in the slate-coloured paint of the roof of the small hut set in the middle distance, and in combination with chrome yellow (see below) for the bright orange strokes of the waterside vegetation. Vermilion is the only brightly coloured 'traditional' pigment to have been used by Monet for *Bathers at La Grenouillère*.

## Blue

*Prussian blue* (ferric ferrocyanide or a similar compound, invented in Germany by Diesbach, c.1710) for the very dark blue of the bathers' swimming costumes; identified microchemically. Also present as an essential component of the pigment mixture known as 'chrome green' (see below).

*Cobalt blue* (cobalt aluminate,  $\text{CoO} \cdot \text{Al}_2\text{O}_3$ , invented in France by Thénard, 1802) [4] is the principal mid-blue pigment of the water, used alone and in mixture with lead white, small quantities of Prussian blue and cobalt violet (see below) for the tonal variations (see Plate 3b, p.25). The presence of cobalt blue in a sample was shown by spectrographic analysis (cobalt and aluminium detected by LMA) and by refractive index measurements on extracted pigment particles ( $\text{RI} = c.1.72$ , by immersion and Becke test). The pigment is also a component in mixed samples of green paint, for example in the dull blue-green of the gunwale of one of the foreground boats (see Plate 3c, p.25).

## Yellow

*Chrome yellow* (lead chromate,  $\text{PbCrO}_4$ , preparation first described by Vauquelin in France, 1809; introduced as a pigment c.1818) and '*Lemon yellow*' (barium chromate,  $\text{BaCrO}_4$ ) [5], mixed together to form the brightest yellow of the background trees; detected spectrographically, by XRD and microscopically.

## Green

*Emerald green* (copper acetoarsenite,  $\text{Cu}(\text{CH}_3\text{COO})_2 \cdot 3\text{Cu}(\text{AsO}_2)_2$ , invented in Germany in 1814) [6], present in several pigment mixtures for various shades of green (see for example Plate 3c, p.25). The pigment is recognizable by its characteristic spherical crystalline particle form and strong birefringence; confirmation of its identity was by LMA for copper and arsenic [7]. *Viridian* (hydrated chromium (III) oxide,  $\text{Cr}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ , invented in France, 1838; available as an artists' pigment by 1862) [8], as one of the pigments in several samples containing heterogenous pigment mixtures. When extracted, viridian particles are microscopically unmistakable as transparent, rich grass-green rounded flakes, showing moderate anomalous birefringence.

'*Chrome green*' (not a single pigment, but an homogenous mixture of chrome yellow and Prussian blue [9]), for the vivid yellow-green paint of the foliage at the left-hand edge of the picture. LMA of a sample showed it to contain iron, chromium and lead and in addition barium, aluminium and silicon, in accordance with one recorded method of manufacture [9].

## Violet

*Cobalt violet* (cobalt phosphate or arsenate, preparation as a pigment first described in France, 1859) [10], in a number of mixed paint samples, for example the mid-blue tones of the water and the mauve flowers near the left-hand edge. The microscopic appearance of Monet's pigment seems close to that of modern

examples being made up of very fine rounded crystalline particles of medium RI and showing strong birefringence. No sample of violet pigment on its own was available, so a chemical identification could not be carried out.

## White

*Lead white* (basic lead carbonate) was the only white pigment apparently present in original paint and deserves no comment. In one patch, zinc white identified in paint partially obscuring part of the sky was deduced not to be original (see Note 2, p.21).

On the evidence of a single early work the pigments found to have been used cannot be said to form a system to which Monet adhered throughout his long painting career. What is noticeable is that the bulk of the pigments in use by 1869 were the products of Monet's own century.

## Notes and references

1. The first half of the nineteenth century saw some striking discoveries in chemistry which were to be of particular relevance to the introduction of new artists' materials. In terms of the number of new pigments which were to flow from the discovery, Vauquelin's 'Memoir' of 1809 on chromium and its compounds is especially noteworthy (*Annales de Chimie*, LXX, pp.90–1). The isolation of another previously unknown metal, cadmium, by Stromeyer in 1817 also contributed significantly to the palette, providing by the mid-nineteenth century a range of yellow to orange shades of cadmium sulphide (the cadmium yellow pigments). Subsequently, early in this century, cadmium yielded another series of pigments based on the metal's sulpho-selenide compounds; in this case ranging from red to maroon.

Developments in organic chemistry in the last century can be considered as of no less importance, with the preparation by William Perkin of mauve in 1856, the first ever organic dyestuff to be made synthetically. In 1868 the first natural dyestuff to be duplicated artificially, alizarin, was synthesized by the German chemists Graebe and Lieberman.

2. Three samples from *Bathers at La Grenouillère* have been analysed for their paint medium by gas-chromatography, and the results reported in the last issue of this *Bulletin*. Since then a fourth sample has been examined, and in all cases the P/S ratio was found to lie between the expected figures for poppyseed and walnut oils. It can be concluded that one or another of the oils, or possibly a mixture of the two had been employed. See *National Gallery Technical Bulletin*, 4 (1980), p.67.

3. See note by Elizabeth H. Jones on Monet's materials in *Monet Unveiled: A New Look at Boston's Paintings*, Museum of Fine Arts, Boston (Boston 1977), p.6.

In a sample from the white ground of the National Gallery picture, XRD has shown the priming to be composed of lead white incorporating a little barium sulphate as an extender. Monet presumably used a commercially primed canvas.

4. Cobalt blue represented a very considerable addition to the palette, being chemically completely stable and possessing a pure blue colour. It has a fair covering power and tinting strength, with good drying properties in oil. Like the traditional blue glass pigment smalt, Thénards blue owes its colour to the cobalt (II) ion; unlike smalt the chemical stability and hiding power are much greater. The structure of cobalt aluminate is that of a normal spinel, with a cubic close-packed array of oxygen atoms in which cobalt (II) ions occupy the tetrahedral holes and aluminium occupies the remaining octahedral sites. Binary oxide structures of this type are likely to make pigments which are permanent.

5. The significance of the discovery of chromium for the artist has been referred to in Note 1 above. Chrome yellow whilst a moderately stable pigment is subject to blackening by sulphides; lemon yellow (barium chromate) is not so affected. However the latter tends to lack brightness and covering power. To an extent the yellow pigments based on chromium tended to be replaced by the more reliable cadmium yellow pigments in the later part of the nineteenth century.

6. Emerald green apparently enjoyed a certain popularity in the earlier part of the nineteenth century, providing a brilliant green substitute for the traditional pigment verdigris. It was however unsatisfactory from two points of view. It was both exceedingly toxic as a result of its relatively soluble arsenic content, and reputedly liable to react with sulphur-containing pigments, although this does not seem to be a particular defect when the pigment is protected in a dried oil film.

Emerald green was eventually entirely displaced from the artists' palette by the introduction of transparent chromium oxide (viridian, see Note 8 below), which suffers none of the disadvantages of the earlier green.

7. Although emerald green is microscopically characteristic, the possibility exists for it to be taken for the spherulitic particles of green verditer (artificial malachite). See p.55 and Note 10, p.57 of this *Bulletin*. Confirmation of the nineteenth century pigment requires either detection of arsenic as well as copper in the sample, or X-ray diffraction analysis.

8. The invention of viridian provided the artist with a pigment of highly desirable properties. It is chemically very stable and suitable for all media both in tint and as a glazing pigment.

It is interesting to find emerald green and viridian present together in Monet's painting of 1869, but this may have been because of some general confusion over the identity of the two pigments soon after the introduction of the newer pigment in 1862. In France viridian is called '*vert émeraude*' (emerald green), whereas copper acetoarsenite (called in England emerald green) is known in France as Veronese green.

9. The two component pigments of 'chrome green' cannot be distinguished under the microscope at normal magnifications since the Prussian blue tends to form a thin intimate coating over the particles of chrome yellow. The pigment mixture will react with alkalis discharging the blue colour of the Prussian

blue, leaving a yellowish brown residue of lead chromate. With acids the chrome pigment passes into solution leaving the Prussian blue unaffected. These two microchemical tests are indicative of 'chrome green'.

The wet method of preparation of the pigment mixture involves the addition of a slurry of Prussian blue to a pulp of barytes (barium sulphate), china clay and chrome yellow. The presence of the extenders barium sulphate and china clay probably accounts for the spectrographic detection of barium, aluminium and silicon in the Monet sample.

10. Until the invention of cobalt phosphate in 1859, no opaque pure violet pigment was available to the artist, ensuring its rapid adoption soon after its discovery.

**Plate 2a** Claude Monet, *Bathers at La Grenouillère* (No.6456). Detail of top right corner during varnish removal. The sky is almost covered by overpaint, and the foliage by a heavy brown glaze.

**Plate 2b** Claude Monet, *Bathers at La Grenouillère* (No.6456). Detail of the brushstrokes of the water, lower right corner.

**Plate 3** Claude Monet, *Bathers at La Grenouillère* (No.6456). Photomicrographs of paint cross-sections, photographed at 220 × magnification in reflected light; actual magnification on the printed page shown beneath each photomicrograph.

(a) Bright red of flowers, left-hand edge.

1. White priming; lead white + barium sulphate (trace).
2. Very pale green paint containing traces of viridian (hydrated chromium oxide) and cobalt blue (cobalt aluminate).
3. Thick layer of vermilion containing thinner seams of a mixed mauve paint. The interpenetration of one layer by another suggests a wet-in-wet method of working.

(b) Mid-blue of the water, right-hand edge.

1. White priming.
2. Pale lavender underlayer.
3. Inhomogenous blue impasto layer of the water. The main pigments are lead white and cobalt blue, as well as small quantities of cobalt violet. The darkest tones of the water's surface contain Prussian blue.

(c) Dull blue-green of boat gunwale, left-hand edge.

1. White priming.
2. Layer containing 'chrome green' (chrome yellow + Prussian blue).
3. Mixed green comprising emerald green (copper acetoarsenite), cobalt blue and some viridian.





**Plate 1** Claude Monet, *Bathers at La Grenouillère* (No. 6456). After cleaning and restoration.



**Plate 3** Claude Monet, *Bathers at La Grenouillère* (No. 6456). Photomicrographs of paint cross-sections. Full caption on facing page.



**Plate 2a** Full caption on facing page.



**Plate 2b** Full caption on facing page.