

# Monet Conservation Project



Argenteuil Basin with a Single Sailboat by Claude Monet (before damage, in normal light)





The painting returned to public view on 1 July 2014 following an extensive 18-month conservation and research project, supported by BNP Paribas and the BNP Paribas Foundation.

Pictured at the unveiling (I-r): Sean Rainbird, Director; Janet McLean, Curator of European Art 1850-1950; Roseanne Connolly, BNP Paribas Ireland; Ele von Monschaw, Paintings Conservator; Pearl O'Sullivan, Monet Paintings Conservation Fellow; Jean-Jacques Goron, Managing Director, BNP Paribas Foundation; Simone Mancini, Head of Conservation



# Contents

About the painting, and acknowledgements		
Technical Report		5
1)	Painting identification	6 6
2)	Research stage	6
3)	Nature of the painting / Monet's painting	7
	techniques	_
The canvas 7		
Monet's use of priming layers		
Monet's use of paint 8		
	Composition / Blocking-in / Paint handling and brushwork	9
	Wet-in-wet / Impasto / Highlights / Signature	10
	Available materials around the mid-19th century	11
4)	Methodology of the technical examination	12
5)	Analytical findings	13
6)	The treatment	19

# About the painting

# Argenteuil Basin with a Single Sailboat

#### Oil on canvas 55 x 65 cm

In June 2012 Claude Monet's *Argenteuil Basin with a Single Sailboat* was badly damaged following vandalism by a member of the public. The National Gallery had to embark on an 18-month conservation project to fully restore the damaged canvas and paint layer of this much loved painting. This treatment offered the opportunity to investigate the materials and techniques used by Monet, as this oil on canvas was completed in the early 1870s at a time when Monet was developing his Impressionist approach to painting. The work was gifted to the Gallery by Edward Martyn in 1924, and has since been a valued part of the collection.

# **Acknowledgement**

This conservation and research project was made possible with the generous support of BNP Paribas, who sponsored the Claude Monet Research and Conservation Project.



We were assisted by our international colleagues, who offered professional expertise and encouragement during the research stage of this project. Sincere thanks to Pierre Curie, Head of Painting Conservation in the Research and Restoration Centre of Musées de France (C2RMF) and his colleagues: Luc Bouiller, Head of Documentation and Archive Department, and collaborators Marie-Liesse Boquien and Christian David. We would particularly like to thank the conservators Bénédicte Trémolières, Francisca Hourrière, and Jean-Pascal Viala. Advice on specialist tear mending was provided by Dipl. Rest. Petra Demuth, Cologne Institute of Conservation Sciences at the Fachhochschule, Cologne.

We also wish to acknowledge the important links between the National Gallery of Ireland conservation department and fellow institutions in Ireland, which allowed for the crucial analysis of material components from the painting. Special thanks are due to Dr David Savage of The State Laboratory of Ireland; Dr Heath Bagshaw at the Centre for Microscopy and Analysis in Trinity College; and Dora Murphy and Carol Smith at the National Museum of Ireland.









# **Technical Report**

The conservation project scope surrounding NGI.852, *Argenteuil Basin with a Single Sailboat* by Claude Monet, encompassed:

- Practical treatment of the painting structural stabilisation and aesthetic reintegration of the damage.
- Historical research into the material history of the painting.
- Analysis of materials used in the painting.
- Implementation of preventive conservation measures for the painting.
- Engagement with sister institutions for the purposes of research development.
- Collaboration with the National Gallery of Ireland's Digital Media Department to develop a web resource for the project.
- Working with the National Gallery of Ireland's Education Department to disseminate information about the Impressionist paintings in the National Gallery to schools throughout Ireland.

NGI number:	852
Artist:	Claude Monet (1840-1926)
Title:	Argenteuil Basin with a Single Sailboat 1874
Medium/Support:	Oil on canvas
Dimensions:	Unframed: 55 x 65 cm H x W. Framed: 79 4 x 89 5 x 9 7 cm H x W x D

# 1) Painting Identification Information:

#### 2) Research stage

Argenteuil Basin with a Single Sailboat (1874) is the only painting by Claude Monet held in the National Gallery of Ireland's collection. During this project, research was conducted to learn more about Monet's painting technique and about previous conservation treatments carried out on Monet's paintings at а transnational level. Our



conservators were given access to examine paintings by Monet in the Musée d'Orsay and Musée Marmottan collection in Paris. Files on all Monet paintings in the French State Collection were made available through the archives of European museums and cultural heritage institutions within the Department of Archives and Innovative Information Technology, located at the C2RMF in the Palais du Louvre site at Versailles. Monet's *Argenteuil Bridge* (1874), housed in the Musée d'Orsay collection, sustained damage following an act of vandalism in 2007. Details of the subsequent conservation treatment carried out at the Musée d'Orsay that year was made available to the National Gallery of Ireland conservators through Pierre Curie, Head of Paintings Conservation in the Research and Restoration Centre of the Musée de France (C2RMF), and his colleagues.

# 3) Nature of the painting / Monet's painting techniques

Technical examination revealed an Impressionist-style painting technique which was pioneered by Monet. In order to choose compatible and reversible materials for the conservation treatment of any painting, and to predict the reaction of the painting to any intervention, it is always important to understand the materials the artist used.

#### The canvas

The canvas Monet used for this painting was a commercially prepared canvas, purchased from the Paris-based supplier Alexis Ottoz.

At the time of Monet's training, instruction manuals for artists still included directions for cutting to



size, preparing, and stretching canvas. However, by the 1840s it made economic sense for artists in France to buy commercially prepared and stretched canvases on which to paint. Monet bought materials from a relatively limited number of suppliers. The supplier's mark (Alexis Ottoz) has been stenciled onto the reverse of the canvas Monet used for this painting. The Ottoz family were a wellestablished artist suppliers in Paris who later became art dealers, selling many Impressionist paintings. The canvas measures 668 x 540 mm, which was the standard size *15* available at this time. In his early career Monet regularly used this size canvas which was easily transportable for painting outdoors on location. The number 15 indicates the price of the canvas in French *sous*.

The canvas is a finely woven linen fabric, according to fiber analysis carried out by Dora Murphy and Carol Smith at the National Museum of Ireland. It is possible for conservators to assess the quality of a canvas by determining its thread count. The thread count in this case is very high (28 threads x 28



threads per cm<sup>2</sup>). This type of canvas was aesthetically superior and conveniently light weight for use when working outdoors. Monet was consistently conscious of using high-grade materials.

#### Monet's use of priming layers



The canvas was commercially prepared with a pale greyish-pink priming layer. In the nineteenth century it was usual for artists to buy canvas pre-primed by a supplier or 'colourman'. The process of priming usually involved the application of an animal glue or 'size' layer to the canvas. This was followed by one or more layers of chalk and lead white pigment bound in oil. A double layer of priming was applied to the canvas used by Monet for *Argenteuil Basin with a Single Sailboat*. This helped to achieve a smooth surface on which to paint. Usually priming layers are plain white in colour, but sometimes red, yellow, or black pigment is added to give the priming a tint.

#### Monet's use of paint



#### Composition

Some of Monet's paintings from this early period show that he made initial sketches in charcoal on the canvas before applying paint layers. No preparatory drawing could be identified under the paint layers of this work. Instead, the composition of the painting was marked out using paint. These initial lines of paint were applied in narrow, continuous brushstrokes. The blue and green horizontal strokes across the centre of the painting were applied during this stage, and indicate the edge of the river and the beginning of land.



### **Blocking-in**

The main fields of colour were blocked-in using pastel tones applied with dry and undiluted paint *(left)*. Monet's handling of paint at this stage was loose and rapid, leaving some of the priming visible. The area below the horizon was initially left unpainted.

#### Paint handling and brushwork

Technical study has revealed the way in which Monet applied the detail and upper paint layers in this work.



**The Impressionist brushstroke** *(above):* Monet did not use thin glazes to build up shadow and form. Instead, his most striking effects were created using a single colour, quite thickly applied using a bold, flat and even-loaded stroke. This type of brushwork has been given the term *tache*, the French word for 'blot' or 'stain'. The *tache* was the basis of the Impressionist paint-handling technique, and was made possible by the invention of a circular metal clamp or *ferule* which allowed for the production of flat brushes – previous to this, brushes were mainly round in shape. The *tache* technique of paint application signalled a move away from the traditional method of blending colours on the canvas. In the foreground of this painting, ripples across the water and the fall of light are articulated using even and thickly applied taches of blue, orange, and white paint.



#### Wet-in-wet

In the painting of foliage, in this picture, Monet applied pure colours neat, straight from the tube, on to the canvas; he did not mix them beforehand on the palette. Subsequent layers of paint were applied before those beneath had dried. This method of painting is termed *wet-in-wet*.

# Impasto

Very little of the priming beneath is exposed on the right-hand side of the painting, and the paint layers are thickly applied. This thicker paint is termed *impasto* and was applied with variously sized brushes.

# **Details and highlights**

The final details of the boat, townscape, and treebranches in the top right-hand corner, were applied delicately using a thin brush. The paint used for these details was applied particularly dry, and resulted in a broken-up paint surface.

# Monet's signature

Although *Argenteuil Basin with a Single Sailboat* has a 'sketchy' or unfinished appearance, it was signed by Monet to indicate its completion. Often Monet signed his paintings in black paint or crayon. In this painting, however, he used the same translucent, bright red, paint as he had applied in the details of the trees. A number of other paintings by Monet from this time,

located in the Musée d'Orsay collection in Paris, are signed using the same colour paint.

# Available materials around the mid-19<sup>th</sup> century



Monet's choice of materials reflects the range of what was newly available to artists in nineteenthcentury France. Monet used commercially produced oil paint, sold in tubes. Prior to the nineteenth century, many artists bought dry pigment and oil as separate components which they ground and mixed together by hand. By the 1840s, however, colour merchants were supplying artists with oil paint contained in collapsible metal tubes. The manufacturer mixed the components of oil and pigment together with additives such as driers and emulsifiers, before packaging the formula into tubes for retail. Oil extracted from linseed, poppy seed and walnut were commonly used to make oil paint at this time. During the nineteenth century many new pigments were invented from chemicals such as Chrome, Barium and Cobalt. The new range of paints made available at this time was adopted for use by many of the French Impressionist artists, including Monet.

# 4) Methodology of the technical examination

Technical tools can be used to understand the materials of a painting and to gauge how these materials will respond to treatment. Initially the conservator uses visual examination - magnified imaging, x-ray imaging and ultraviolet light examination.

In order to find the best way of treating this painting with compatible and reversible materials, the conservators needed to know whether the paint and varnish layers are sensitive to certain solvents. Seven percent of the fragments lost during the damage were so tiny that even with a powerful microscope it was impossible to relocate them back into the painting. These tiny pieces of priming, paint and varnish were set in resin and used to examine the



layer structure of the painting. At microscopic level (200x magnification) the materials in the painting could be tested with chemical-staining dye for binding medium identification using Rhodamine-B and Amino-Black staining solutions. Other fragments that were large enough to be re-inserted into the conserved painting were investigated for inorganic compounds by the State Laboratory using the non-destructive method of energy dispersive x-ray fluorescence (Rigaku Nex CG), carried out by Dr David Savage.

SEM-EDS (Scanning Electron Microscopy coupled with Energy Dispersive Spectroscopy) was conducted on a selection of samples to identify inorganic pigments and additives used in the ground and paint layers. SEM-EDX facilities were sourced at the Centre for Microscopy and Analysis at Trinity College Dublin and carried out by Dr Heath Bagshaw.

Samples of original canvas were taken from the unpainted tacking margin and submitted for analysis at the National Museum of Ireland textile conservation unit, and tests were carried out by Dora Murphy and Carol Smith.

# 5) Analytical findings

# Visual and photographic inspection

Visual examination in normal light confirmed the layer technique of Monet's paint application, as explained in detail in section 3 above (p. 7). Visual examination of the painting under ultraviolet light suggested that the varnish coating was a modern synthetic resin. This was confirmed by solvent testing. The x-ray imaging tested negative for a concise charcoal under drawing, and no hidden painting or previous use of the canvas could be found.

A sample set in resin is called a *cross section* and gives indication of the layer structure when viewed under the microscope.



The cross section image above shows the build-up of layers in *Argenteuil Basin with a Single Sailboat*. From the bottom upwards, six distinct material layers can be identified: canvas support with glue size, lower primer, upper primer, paint layer, glaze layer and varnish layer. The glue and priming layers were applied to the canvas by the commercial colourmen who also tacked the canvas onto a wooden stretcher before Monet purchased it.

#### UV light investigation, together with inorganic pigment analysis

Elemental analysis, coupled with microscopic examination, ultraviolet light observations and literature referencing, allowed for identification of Monet's choice of some pigments.

In this painting Monet used a range of opaque pigments including a dark blue, dark green, deep red, yellow and orange. He also used transparent Red Lake. Technical analysis has made it possible to identify some of the pigments Monet used in this painting, as follows:

**Vermillion:** The dark red pigment used in foliage and for the outline of the sail boat is likely to be vermillion. It characteristically appears very dark under ultraviolet light.

**Red Lake:** The transparent red used in the foliage and the artist's signature. It appears bright orange under ultraviolet light. This is characteristic of the organic pigment rose madder lake.

**Chrome Yellow and Orange:** These became popular new pigments in Europe during the mid- to late nineteenth century. It will be possible to securely identify the yellow pigment in this painting using inorganic elemental analysis.

# Solvent testing

Solvent testing supported the ultraviolet light image, suggesting that the varnish was a modern synthetic resin with some added wax. Solvent tests also indicated that the bright red and yellow paints were very sensitive to solvents.

# Canvas fibre analysis

Analysis of fibres from the original canvas was carried out at the National Museum of Ireland textile conservation laboratory. Findings confirmed that the canvas is linen-based, most likely flax (Linum usitatissimum).

# **Medium analysis**

The staining tests on paint and priming layer carried out on the cross sections tested positive for oil, and negative for glue.

# 6) The Treatment

# Stabilising the painting



Before the painting was moved from the exhibition space, conservators examined the painting for signs of loose paint and flaking, temporarily securing any loose fragments. As a result of the impact sustained by the painting, tiny fragments of paint and ground came loose and were deposited on the painting's surface and the ground nearby. These fragments were carefully collected and stored for later reinsertion. The painting was removed from public display and taken into the conservation studio for treatment. It was laid flat and stabilised from the front and back. Conservators removed the painting from its frame and documented any changes to the condition of the object.

#### Securing the paint layer



Repair work to the damaged canvas was carried out on the back of the painting. Before turning the painted side down onto the cushioned working surface, a temporary cover was applied to protect the valuable paint surface. A conservation grade tissue was adhered to the varnished surface of the painting using a low concentration of waterbased animal glue. This application of protective material to the front of the painting is termed *facing*. It temporarily strengthened the painting, and was easily removable, posing no risk to the paint or priming layers beneath. Once the painting was turned with the paint layer facing down, tacks were carefully removed, releasing the canvas from its wooden stretcher. This freed the canvas support and allowed for better access to the back. Careful monitoring of the canvas was needed while it was released from the stretcher.

#### **Tear repair**

The canvas support of *Argenteuil Basin with a Single Sailboat* had been locked into a close weave for over 130 years. As a result of the impact sustained, the tear edges were sharp and misaligned. The process of tear



repair involved flattening, aligning and re-joining the edges of the torn canvas. Initially the canvas was relaxed using localised application of moisture and gentle weighting for short intervals – training it to remain flat again. With the aid of a high-powered microscope and appropriately small tools, the tear edges were carefully aligned threadby-thread. Re-joining of the realigned, broken canvas fibres involved applying a specially formulated adhesive to achieve a strong but reversible bond between the thread ends. This adhesive material has been used and developed by painting conservators in Germany over the past 40 years.

#### **Materials and tools**



A wide range of tools were employed by the Gallery's conservation team in carrying out this treatment. Examples shown here include small steel surgical tools for working on tiny areas using a microscope; a mini hot spatula for applying controlled and localised heat to the painting; a warming plate and glass containers for keeping adhesive at a constant temperature. Hydrated collagen adhesive was made in-studio.

#### Removing the protective facing

Once the tears had been re-joined, it was possible to return the painting to a face-up position. At this point the protective facing tissue and adhesive could be removed from the paint surface using a small amount of



moisture. The painting has a modern glossy varnish layer which was not applied by the artist. This synthetic varnish had greyed due to the build-up of particulate dirt on the surface. Aesthetically it would have been ideal to remove this varnish, to recover the matte surface, probably left unvarnished by Monet. Due to the sensitivity of the pigments, however, National Gallery conservators decided not to remove the varnish. Instead, a surface clean was performed by removing the dirt embedded in the top of the varnish while removing the facing. This shifted the tone of the painting towards a brighter and lighter appearance, bringing the colours closer to how they may have originally looked.

#### Lining the painting

In some cases, it is possible to treat a damaged canvas using the technique of tear repair alone. In the case of this work, however, it was necessary to also carry out a lining treatment to provide both effective and sustainable support to the priming and paint layers of Monet's masterpiece. А lining



treatment involves adhering a secondary canvas, or material support, to the reverse of the original canvas.

The National Gallery's conservation team designed a two-step lining treatment: the double frame heat dispersal system. During the first stage, the lining material and interlayer were adhered at a conventional temperature. For the second stage, which involved the painting, a lower temperature was used. Traditional methods of lining have often involved use of a vacuum envelope over the painting. In this case, a double-framed opening was designed to prevent over-heating and flattening of the paint surface. The lining materials were chosen for their stability, compatibility with the original canvas, and their potential to be reversed. A finely woven linen canvas was used as the primary lining material. Non-directional synthetic material was inserted as a cushioning interlayer, and thermoplastic adhesive film was used to adhere the materials.

#### **Re-stretching the canvas**



The lining produced very positive results, providing increased strength and stability to the canvas support while maintaining the complex texture of the paint surface. After the lining process was complete, the now fully stabilised painting was returned to its stretcher, and tacked on using the original tacks wherever possible.



#### **Returning paint fragments**

Over one hundred loose paint fragments splintered away from the painting as a result of the damage. These were collected and stored until they could be reinserted after the painting was lined and returned to its stretcher. These pieces were very small, the majority measuring between 0.3 and 1mm. Some of the pieces had fragmented into a powdery dust and therefore could not be reinserted into the area of repaired damage.

# **Filling and retouching**



Tiny areas of paint loss (where fragments could not be inserted) were filled with reversible material made from chalk and a low percentage solution of animal gelatine glue. This material, termed *gesso*, was pigmented to match the colour of the original priming layer.

Conservators applied the *gesso* with a very small sable brush, using the aid of a microscope. It was applied to achieve a texture that matched the surface of the painting. All of the materials used for filling and retouching are water-based, and can be removed from the painting in the future without affecting the original oil paint.

The final stage of treatment involved localised application of watercolour to the areas of exposed fill. This technique is termed *retouching*, and is distinguishable from the original paint as a darker material under ultraviolet light.

#### **Preventive conservation**



The conservation treatment of *Argenteuil Basin with a Single Sailboat* also involved stabilisation and preservation of the object for the future. To reduce exposure to environmental fluctuations, a climate box was constructed for the painting. This involved fitting the original frame with a low-reflective, ultraviolet-filtered glass and inserting a conservation-grade, solid support behind the painting to minimise movement of the canvas. A pre-conditioned humidity buffer was also included in the climate box. Finally, a backing board was fitted onto the frame build-up, and sealed with inert aluminium tape. These preventive measures will help to preserve the painting and lining materials in their current condition, allowing for safer handling and movement of the painting.