Case Study

A fresh look: technical analysis and treatment of Picasso's *Science and Charity* at the Museu Picasso

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Received: 7 May 2019 / Accepted: 10 March 2021 / Published online: 26 March 2021
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Abstract

The condition of the Picasso's *Science and Charity* has always been a matter of concern for the Conservation Department at the Museu Picasso in Barcelona. In the last few years, several historical and technical lines of research (based on vintage photographs and physicochemical studies) have increased the understanding of the painting's materials and how they have responded to the different environments since the painting was created. In 2017, a campaign was launched to consolidate flaking paint, remove traces of animal glue, and correct colour retouching from previous inpainting campaigns and filling issues from previous treatments from 1970. The new treatment was successful, with cracks and cuppings being stabilized. The treatment heavily relied on high-resolution, multi-band images, as well as research from a previous study published in 2010. Infrared reflectography and colorimetry provided new information and corroborated a new vision of the creative process that had previously only been based on micro-analyses of samples. *Science and Charity* provides a relevant case study as the painting suffers from many degradation problems that are found in other Picasso paintings restored in the same period.

Keywords Picasso · Creative process · Degradation agents · Lining consequences · Mechanical properties · High resolution multi-band images · Colorimetry

1 Introduction

From a strictly conservation perspective, *Science and Charity* was a wounded painting. This artwork clearly suffered over time, from the moment it was created up to the present day. For more than a century, the surface of the painting, the internal structure and the canvas have undergone major changes. This paper will go through the history and conservation treatments of the painting *Science and Charity*, in chronological order, in order to understand its current state of conservation.

The driving forces that explain the deterioration of the painting range from more minor reasons (the small working space of the studio and the environment of the painting in the painting's early years) to two main causes:

1. Picasso's specific painting technique here consisted of a succession of corrections and overpaints. This way of working gave the painting a structure that would determine how the materials would deteriorate over time [1].
2. An aggressive lining process was carried out after Picasso donated the painting to the Barcelona museum in 1970.

2 The origins of *Science and Charity*: Picasso's last academic painting

In late 1896, a young Picasso had just turned 16 and was about to start working on this impressive piece firmly rooted in the 19th-century manner. Picasso painstakingly

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dedicated himself to the creation of a painting worthy of entry to the XVI *Exposición Nacional de Bellas Artes de Madrid*, 1897.

The subject of the painting, which can be classified as *social realism* in general and falling into the hospital sub-genre in specific, was carefully chosen to match contemporary tastes in Spanish and international circuits. Guided by his father, Don José, the young Picasso opted to follow the official model. According to Sabartés, friend and private secretary of the artist, “This picture whose subject has been proposed by Don José himself, represents a sick woman lying on a pallet. In the background a Sister of Charity with an infant in her arms offers a bowl of broth to the patient. A doctor sitting in the foreground is taking her pulse. This is Pablo’s father who served as his model for the doctor” [2].

Science and Charity is an ambitious painting in several ways: its large size ($197 \times 249.5 \text{ cm}^2$), its composition, the carefully constructed, natural-scale figures, and the signs of Picasso’s increasing skill as a portrait painter, particularly with regard to the figure of the doctor, whose face he painted decisively, *alla prima* and without any correction.

Picasso’s growing maturity as painter can also be observed in the way he crafted and presented the figures’ hands. It is worth remembering that the previous year he had taken part in a local exhibition,¹ where he had presented *The First Communion* (Barcelona, 1896). The dimension and composition of this painting were less remarkable and he had resorted to tricks to avoid the difficulty of painting hands.

3 The creation of the painting

3.1 Creative space

Picasso painted *Science and Charity* in a small attic near the seafront in Barcelona. The attic’s original size remains unknown, but photographs taken before the building was demolished in 2015 show that it was a small space to work on an oversized painting. The small working space of the small studio presumably made it hard for Picasso to manoeuvre the canvas. This includes setting up the stretcher, stretching the canvas, transporting it, fitting it, and applying colour. It is unlikely that the painting could have been carried up and down the narrow staircase without first removing it from the stretcher and whether the walls in the studio were high enough for the $2 \times 2.50 \text{ m}^2$ stretcher.

¹ Exposición de Bellas Artes e Industrias Artísticas de Barcelona.

3.2 Changes to the work

Current knowledge and equipment make it possible to confirm that Picasso worked on this oil on canvas painting over an extended period of time. The first clear indication of this was found in 2008, when the x-radiography revealed a number of changes² (Fig. 1). The x-radiograph image shows that Picasso created the painting over several sessions, during which he made major alterations to the figures (for example the position of the child, the nun’s head, the cup, and the doctor’s hands and beard).

3.3 Identification of materials

Picasso also made changes to the palette, as revealed by six samples analysed in 2010 [1, 3]. Optical microscopy (OM) was used to determine the morphology and composition of the materials. This was complemented with scanning electric microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR).

Table 1 presents the pigment composition found in the different coloured areas, as a result of Raman analysis in 2006 and FORS in 2018.³ Picasso did not apply the pure colours but made mixtures of two or more components, in order to achieve a greater tonal richness.⁴

Picasso used an industrially manufactured, oil-based, white-primed linen canvas, similar to the ones used in previous works analysed in earlier conservation campaigns. As Picasso applied colour in successive and uneven layers, the painting is very complex and thick, with a rough and uneven surface. Areas of the painting have deteriorated differently over time, according to paint thickness, pigment combinations, and pigment concentrations.

3.4 Stratigraphy of painting

Two areas of stratigraphic interest that are partially invisible in the x-radiograph are the child and the bed. The child was originally painted naked and then was clothed in two different outfits. Earlier sketches painted by Picasso, most of which are in the Barcelona collection⁵ (MPB 110,099,

² X- radiography was completed using 35 keV and 6 mA. Eight 35 cm film strips were assembled in situ in the gallery and were later digitized.

³ Internal technical report.

⁴ All the pigments analysed are consistent with those Picasso used the previous year for *The First Communion*, according to the Raman spectroscopy study carried out by the Universitat Politècnica de Catalunya (UPC) in 2006. Unpublished report made by Sergio Ruiz.

⁵ The Museu Picasso in Barcelona has six sketches; another sketch is at the Musée National Picasso-Paris; and two further sketches are in private collections.

Fig. 1 image x-radiograph. In red the final composition and in green the image not visible. © of the reproductions of works by Pablo Picasso: Pablo Picasso's estate. VEGAP. Madrid, 2020. Permission to reproduce courtesy of VEGAP

Table 1 Identification of the palette

Blues	Ultramarine blue and Prussian blue
Whites	Lead white, barium sulphate, zinc white, calcite
Black	Bone or ivory black
Yellow/oranges	Naples yellow, chrome orange
Reds	Vermillion, carmine, minium
Greens	Emerald green, chrome green

This appears in the priming of the canvas

MPB110229, MPB110149) show that the bed was painted with a white sheet, only to be subsequently covered by a brown blanket. The child's earlier position had already been revealed by x-ray analysis, but a recent treatment on a repainted area revealed traces of red (from the child's original outfit) and black (from the nun's habit, indicating a change in position). Figure 2 shows stratigraphic image from a sample in sheet area.

Another recent, in-depth look was provided by the results obtained by infrared reflectography⁶ which

Fig. 2 Stratigraphic image from sheet area. © of the reproductions of works by Pablo Picasso: Pablo Picasso's estate. VEGAP. Madrid, 2020. Permission to reproduce courtesy of VEGAP

complemented the x-radiography results [4]. The different densities revealed that the paint varies in thickness along the pictorial surface and therefore has different degrees of hardness and flexibility and consequently cracks [5].

⁶ Research carried out by M. Picollo and L. Stefani from Istituto de Fisica applicata "Nello Carrara" in the framework of the ProMeSA project funded by the Ministerio de Economía, Industria y Competitividad (MICINN/FEDER)- Programa Estatal de Fomento de la Investigación Científica y Técnica de Excelencia, Subprograma Estatal de Generación del Conocimiento (HAR 2016-75131-P).

3.5 Colorimetric analysis

The exhaustive colorimetric analysis shed⁷ more light on the evolution of the painting and revealed further details of how the young Picasso proceeded. The results enabled a coherent narrative, together with a detailed study of the same three preliminary sketches. The three sketches and the final painting were analyzed with spectroscopic techniques, including visible (Vis), UV and near infrared (NIR) fibre optic reflectance spectroscopy (FORS), in the 350–2200 nm range, on various spots of the surface of the sketches and painting. As well, reflectance hyperspectral imaging (HSI) in the 400–900 nm (VNIR) and 950–1650 nm (SWIR) ranges was carried out.⁸

Colorimetric values obtained from reflectance spectra of relevant areas contributed to the understanding of the palette evolution. Applying different nuances, Picasso accentuated the drama of the scene. This evolution can be seen in the three sketches and also in the final painting, for example where the woman's mortuary complexion contrasts with the white sheet. Picasso made a clever choice of pigments. Whereas he mostly used lead white (both pure and in mixtures) in his paintings, he decided to use also zinc white in this case. These two different white pigments were identified using the techniques listed in the previous paragraph.⁹

It is evident that the minor works are not strictly preparatory sketches as such, but provide a visual account of Picasso's trials and errors during the creative process. The sketches therefore offer a valuable insight into how the artwork evolved [4, 6].

3.6 The environment

The environment certainly played a part in causing damage. This caused mechanical movement due to changes

in location and the circumstances (including fluctuating temperatures) in which the painting was kept. The conditions in 1897 would not be ideal for a large painting to be packed and shipped hundreds of kilometres away (with an itinerary of Barcelona-Madrid-Málaga-Barcelona). Also, there would be the added stresses from rolling and unrolling the canvas repeatedly. Documentary evidence (photographs and testimonials provided by Picasso's close relatives) showed that during the years the painting was kept at the family home in Barcelona (1918–1970), the work had no stretcher and was nailed to the wall around all the edges. The old photographs show that during the first half of the twentieth century, before the painting arrived at the Museu Picasso in the 1970s, it spent more time without a stretcher than with one; the painting was therefore subjected to vibrations and other agents of deterioration including impact and water leaks, that contributed to weakening the canvas and the paint film (Fig. 3) [7]. In summary, the various changes in location, the means of transport and the conditions in which the painting was kept, contributed to making the artwork's materials more unstable.

4 The 1970 Intervention

4.1 The consequences of lining treatment

The restorers had to design a conservation strategy for the painting that had not been stretched for over fifty years and which showed signs of having been subjected to damp conditions. The intervention followed the conventional conservation protocols of the time.¹⁰ During the first phase, work was carried out at the family home to apply a facing to protect the paint layer. The canvas was then rolled around a rigid cylinder in order to be shipped. Once at a conservation studio,¹¹ the painting was glue-paste lined. Filling work was carried out to replace lost material, colours were retouched and a new coating of varnish was applied. In early December 1970, the restored *Science and Charity* was transported to the Museu Picasso in Barcelona to be exhibited for the first time. The glue-lining treatment performed in 1970 was quite invasive and contributed massively to the degradation the painting shows today.

⁷ Data obtained with a CM-700d Konica-Minolta spectrophotometer. M. Picollo, C. Cucci, L. Stefani, R. Jiménez-Garnica, L. Fuster-López, "Picasso's 'Science and Charity' and its three oil sketches: a comparison of their hues through their chromatic values" in XIV Color Conference, Florence (Italia), September 11–12, 2018. Colour and Colorimetry. Multidisciplinary Contributions. Vol. XIV B. Proceedings of the 14th Conferenza del Colore, p. 167–176; M. Picollo, C. Cucci, L. Stefani, R. Jiménez-Garnica, L. Fuster-López, A. Vila, "Chromatic values in Pablo Picasso's early work: a comparison of hues in 'Science and Charity' (1897) and its three oil sketches" in *Cultura e Scienza del Colore—Color Culture and Science*, vol. 11 (2), pp.34–42.

⁸ HSI on the painting *Science and Charity* was acquired only in the SWIR region.

⁹ Other white pigments are Barium sulphate, Ba(SO₄), that may be a filler or thickener present in the commercial paint, and calcite, CaCO₃, that appears in the priming of the canvas.

¹⁰ There is little documentation on the 1970 restoration beyond black-and-white pictures of the process and several reports written ten years later.

¹¹ Municipal museum workshop in Barcelona.

Fig. 3 *Science and Charity* hung without a stretcher. c1959. Francisco Melich. Arxiu Museu Picasso, Barcelona. © of the reproductions of works by Pablo Picasso: Pablo Picasso's estate. VEGAP. Madrid, 2020. Permission to reproduce courtesy of VEGAP

4.2 The last trip

In 1980 *Science and Charity* was packed again, this time with a stretcher, and transported to New York for a “Pablo Picasso: A Retrospective” exhibition at MoMA. An accurate report raised the first concerns about the condition of the painting, pointing out the sections that had deteriorated the most and setting out a series of preventive measures to be taken for shipping.¹² The report included further information on the 1970 restoration, including the additional ironing carried out after the 1970 glue-lining process. During the following 37 years, the paint layer deteriorated considerably and small repairs had to be made regularly.

5 The 2017–2018 conservation and restoration project

Following a detailed study of the condition of the painting, a new restoration campaign was performed in 2017. All the available information on the artwork's history was brought together to create a detailed report of the alterations and to determine the different degradation processes within the painting.

Of the various causes of degradation stated in the introduction, the two main and decisive factors of alteration were: Picasso's technique and the lining treatment carried out in 1970. The other two causes should not be forgotten: the far-from-ideal conditions in a private house where the painting was created and kept during the first half of the twentieth century and its subsequent environments and relocations.

The 1970 treatment has interfered with the proper conservation of the work. During the lining process, the canvas and the paint layers were subjected to significant mechanical stresses. The high temperatures during lining process caused pronounced blisters, as well as the softening and crushing of impastos and the formation of pressure marks. High temperatures may have contributed to modify the paint films, making them more brittle and fragile.

Over the years, *Science and Charity* experienced further degradation. The paint layers were extremely cracked, from the process of rolling the canvas. Losses were observed, especially in areas with the thickest layers of paint (such as the blanket, some white sections and the lower section). In addition, the presence of foreign materials in crevices and hollows of the rough surface, such as traces of animal glue from the facing and glue paste from the lining, had not been properly removed and had caused some mechanical stress to the paint film.

There is now a better understanding of the physical, chemical, and mechanical behaviour of materials, as well as the causes of the paint film's loss of flexibility and

¹² See the reports of Museu Picasso Research Centre dated on July 30th, 1979.

Fig. 4 Before and after color fixing treatment. (detail from high resolution visible image) 2017–2018 Arxiu Museu Picasso, Barcelona. © of the reproductions of works by Pablo Picasso: Pablo Picasso's estate. VEGAP. Madrid, 2020. Permission to reproduce courtesy of VEGAP

increase in fragility. It is interesting to observe the cracks and the interaction between the layers. The complex laminar structure has caused different mechanical interferences. The degree to which each layer has been maintained has been determined by its physical structure and the chemical composition of the pigments.

6 The 2017–2018 treatment

Once the reasons behind the current condition of *Science and Charity* had been identified, the conservation strategy aimed to remove, or at least minimise, any material that could compromise the mechanical stability.

The latest treatment consisted of two phases: removal of surface materials from the previous treatments and consolidating the flaking paint. Before and during the

conservation process, high-resolution, multiband images were taken with visible (VIS), ultraviolet (UV) and infrared (IR) light. This provided a valuable database that revealed details of both the surface and the inner layers. This documentation provided a more precise understanding of the procedures used by Picasso to build the painting and its current condition (Fig. 4).

The first cleaning process¹³ aimed to remove the traces of adhesive that had crystallised after fifty years on the paint surface, that were trapped in the crevices and hollows of the paint film. The combined action of wetting with an aqueous solution and the mechanical removal was successful and some relaxation was observed. The empirical observations made during the treatment suggested that removing the glue had contributed to reducing the overall tension in the artwork and that some flexibility seemed to be regained. In the second cleaning phase, the varnish added in the 1970s was removed¹⁴ [3, 8]. The treatment was completed by removing the highly invasive and colour mismatched retouches, which were later replaced with fills and inpainting that followed the painting's original surface and colour scheme.

Once the cleaning had been completed, the process to consolidate the flaking paint aimed to reconnect the paint film and rebuild the painted structure, from the deepest layers in contact with the canvas through to the outer layers. For this purpose, a mini low-pressure table was used. In order to access the central areas of the painting, the table was adapted to be used vertically. Suction, temperature and humidification were the three key parameters used to make the adhesive penetrate, restore the adhesion in between layers and reduce in-plane distortions. Various protein adhesives (sturgeon, hide and fish) were tested and Lefranc and Bourgeois hide glue was selected due to its appropriate penetration and adhesive strength. The hide glue's compatibility with the original materials as well as those applied in previous restoration was also considered. The consolidation was very satisfactory and the adhesion in between layers was restored. Finally, the treatment of lacuna in the paint layer was carried out. Fills were prepared with calcium carbonate and animal glue to achieve the appropriate density. The texture of the surface was also adjusted in order to achieve a similar colour as in the original paint surface. Retouching was done with watercolour and finished the surface with a dammar¹⁵

¹³ We should also like to thank Elena Aguado for the pH and conductivity study.

¹⁴ The 2010 UB analysis determined cyclohexanone.

¹⁵ Dammar resin is reversible over the years and is stable under controlled light conditions.

Fig. 5 Before cleaning UV image, and before and after retouching VIS image (detail from high resolution multiband images) 2017–2018, Arxiu Museu Picasso, Barcelona. © of the reproductions of

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resin-based medium.¹⁶ Regular assessments are carried out and after two years no signs of further degradation have been observed (Fig. 5).

Regarding the protective measures, new procedures were carried out to ensure future stability¹⁷ and a loose lining¹⁸ was carried out. The area in between the original canvas and the new polyester fabric minimized the natural tendency of the canvas to oscillate, thus preventing undesirable movements that might once again put the materials' stability at risk.

7 Conclusions

Science and Charity is an example of a complex structure made up of materials that interact with each other and result in a dynamic network; this includes uneven colour layers that were applied at different times. The challenge posed by *Science and Charity* mainly resulted from a combination of two major factors: an unfortunate lining treatment where excessive temperature, pressure and stiff adhesives were applied and the presence of several paint layers. Two essential approaches, a study of the constituent materials and an understanding of the degradation mechanisms, were needed to make informed conservation decisions. The large painting collection from Picasso's first

artistic period makes Museu Picasso Barcelona a leading museum worldwide for the study of the young Picasso. One cannot forget that Picasso's formative years were a key moment of transition from the 19th to the twentieth centuries and, in particular, *Science and Charity* is the painting that closes Picasso's period of academic training that follows traditional pictorial procedures.

Acknowledgements Museu Picasso thanks preliminary studies carried out by Patrimoni-UB Universitat de Barcelona and Andrés Sánchez Ledesma (ARTE-LAB). This study has been able to progress within the framework of the R+D Project HAR2016-75131-P 'Study of the mechanical and dimensional properties of commercially manufactured paint films and their influence in the physical and chemical degradation of modern and contemporary paintings' (2017–2019) granted by the Ministerio de Economía, Industria y Competitividad de España (MICINN/FEDER) -Programa Estatal de Fomento de la Investigación Científica y Técnica de Excelencia, Subprograma Estatal de Generación del Conocimiento.

Declarations

Conflict of interest The author declares that they have no conflict of interest.

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¹⁶ In Shellsoll A + Shellsoll D-40 (30%–70%).

¹⁷ The project was completed a year later by installing the work in a passive control showcase conditioned at 50% RH.

¹⁸ A stretcher lining with a 100% polyester sheet (Shock Textil).

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