

Tracing the material history of MAC USP's *Self-Portrait* by Amedeo Modigliani¹

<http://dx.doi.org/10.1590/1982-02672019v27e11d1>

ANA GONÇALVES MAGALHÃES²

<https://orcid.org/0000-0002-2291-428X>

Universidade de São Paulo / São Paulo, SP, Brasil

MÁRCIA DE ALMEIDA RIZZUTTO³

<https://orcid.org/0000-0002-9779-0349>

Universidade de São Paulo / São Paulo, SP, Brasil

DALVA LÚCIA ARAÚJO DE FARIA⁴

<https://orcid.org/0000-0003-1889-6522>

Universidade de São Paulo / São Paulo, SP, Brasil

PEDRO HERZILIO OTTONI VIVIANI DE CAMPOS⁵

<https://orcid.org/0000-0003-0022-9289>

Universidade de São Paulo / São Paulo, SP, Brasil

ABSTRACT: This two-part article (history and analysis, followed by the interpretation of data obtained via analytical techniques) is a study of Amedeo Modigliani's *Self-Portrait* (1919, oil/canvas, 100 x 65 cm²), which belongs to the Museu de Arte Contemporânea of the Universidade de São Paulo (MAC USP). By collating documentation on the work's provenance, critical sources regarding Modigliani's approach to painting, and technical-scientific (physicochemical

1. This research was conducted with the support of the São Paulo Research Foundation (FAPESP), within the Thematic Project *Coletar, Identificar, Processar, Difundir. O ciclo curatorial e a produção de conhecimento* (Collect, Identify, Process, Disseminate. The curatorial cycle and the production of knowledge) (2017/07366-1).

2. Associate Professor, art historian, and curator of the Museu de Arte Contemporânea of the Universidade de São Paulo (MAC USP). E-mail: <amagalhaes@usp.br>

3. Professor at Instituto de Física of the USP. As a coordinator of the *Núcleo de Pesquisa de Física Aplicada ao Estudo do Patrimônio Artístico e Histórico* – NAP-FAEPAH (Nucleus of Physics Research Applied to the Study of Artistic and Historical Heritage, <<http://www.usp.br/faepah/>>), she has a special interest in non-destructive analysis of cultural heritage objects using physical and chemical methodologies. Email: <rizzutto@if.usp.br>

4. Associate professor, Department of Fundamental Chemistry, Instituto de Química of the USP. Bachelor of Chemistry, Master and Doctorate in Chemistry (Physical Chemistry) at USP. E-mail: <dlafaria@iq.usp.br>.

5. Bachelor of Physics from Universidade de Campinas (Unicamp), Degree in Physics from Unicamp, Master and Doctorate in Physics at USP. E-mail: <pcampos@usp.br>.

and imaging) analyses, we were able to reassess it in light of the articulation between the work's materiality and composition. We also managed to throw new light on the work's critical reception in the 1950s, when it arrived in Brazil and received international exposure – at that time, already part of a Brazilian collection – by means of publications and exhibitions.

KEYWORDS: Amedeo Modigliani. Modern painting. Technical history of art. Analytical techniques

RESUMO: Este artigo em duas partes (histórico e análise, seguida da parte de interpretação dos dados obtidos por técnicas analíticas) apresenta um estudo da obra *Autorretrato* (1919, óleo/tela, 100 x 65 cm) de Amedeo Modigliani, pertencente ao acervo do Museu de Arte Contemporânea da Universidade de São Paulo (MAC USP). Através do cotejamento entre a documentação de procedência da obra, fontes críticas de abordagem da pintura de Modigliani, com as análises técnico-científicas físico-químicas e de imageamento, foi possível reavaliá-la na articulação entre sua materialidade e sua composição, bem como lançar nova luz sobre sua recepção pela crítica dos anos 1950, quando ela chegou ao Brasil e circulou no contexto internacional por meio de publicações e exposições, já como parte de uma coleção brasileira.

PALAVRAS-CHAVE: Amedeo Modigliani. Pintura moderna. História técnica da arte. Técnicas analíticas.

As an early modernist artist, Amedeo Modigliani (1884–1920) is much celebrated and popularized in the history of modern art. Born in a Jewish family from Livorno but formed within the environment of the Paris School, in the first two decades of the twentieth century the artist successfully managed to avoid being linked to any form of “ism.” Perhaps paradoxically, however, only after his immortalization in Paris could Modigliani go on to conquer his homeland of Italy. Despite the artist’s posthumous fame, scholars devoted to studying Modigliani’s life and work have always emphasized his misery, extreme behavior and bohemian habits. This led to Modigliani’s precocious characterization as a *maudit* painter.⁶ His untimely death and the tragic suicide of his last wife – the then pregnant Jeanne Hébuterne (1898–1920), also a painter – further lent credence to this characterization, transforming Modigliani into somewhat of a modernist anti-hero. Most likely, it also ensured his huge celebrity status, exorbitant prices for his works in the international market,⁷ and the imperative of having a Modigliani in any modern art collection.

The historiography of Modigliani’s life and work has revolved around two aspects: narratives of his personal life, in which the testimonies of those he lived with play a seminal role; and a constant investigation of the authenticity of his works.⁸ Another important element in this historiography is the emphasis on his paintings of portraits and feminine nudes. Although they are indeed recurrent in his production, these pictorial genres seem to be frequently regarded from the standpoint of a necessary dialogue with Modigliani’s private life, his friends and his turbulent relationships with women. Thus, in a way, one appears satisfied to speak of Modigliani, the character, rather than Modigliani, the painter. So, what do we actually know about Modigliani, the painter? And, more specifically, what do we know about his *Self-Portrait* (figure 1), nowadays part of the collection of the Museu de Arte Contemporânea of the Universidade de São Paulo (MAC USP)?

Based on technical-scientific analyses performed between 2017 and early 2018, this article sheds light on Modigliani’s only self-portrait painting. This initiative was a MAC USP contribution to a new material study of the artist’s work, by occasion of the “Modigliani” exhibition at Tate Modern, in London.⁹ Besides what may be inferred from the results of the abovementioned analyses, we will review the history of Modigliani’s arrival in Brazil. Furthermore, we intend to contribute to a formal analysis of *Self-Portrait*, comparing it with other portraits made by the artist in his later years – considering his deep appreciation for Cézanne as a portraitist. In this sense, a comparison between Modigliani’s self-portrait and his portrait of Leopold Zborowski, on one side, and Cézanne’s *Madame Cézanne in Red* (both from the Museu de Arte de São Paulo – MASP collection), on the other, may be useful for clarifying how the cultural environment

6. Coquiott (1924, p. 104–105).

7. Cf. Pogrebin; Reyburn (2015). His *Nu couché* was sold in Christie’s New York (Lot 8A, sale 3789), on November 9, 2015. It reached a record value compared to previous sales of paintings by the artist.

8. Cf. Restellini (2002). This is largely due to the work of critic and archivist Christian Parisot (Cf. Cohen, 2014). For decades, Parisot benefited from his close contact with the artist’s only daughter, Jeanne Modigliani. She gave him full powers to organize the Modigliani archival fund and create the *Modigliani Istituto* in Rome (website: <www.istitutoamedeomodigliani.it>, currently based in Spoleto). There are at least three authors who have dedicated themselves to cataloging the artist’s work: Arthur Pfannstiel (1956), Ambrogio Ceroni (1965) and Osvaldo Patani (1991). The Patani catalog was adopted here, since it is the *catalogue raisonné* that is available in MAC USP’s library. For an analysis of the evolution of the general cataloging of the artist’s work. Fraquelli, Ireson & King (2018, pp. 189-195).

9. Cf. Fraquelli & Ireson (2017) and Fraquelli, Ireson & King (2018). The Tate Modern project’s aim was to update the first material study on Modigliani’s works, which had been undertaken by France’s museological research laboratory in the early 1980s. Cf. Contensou & Marchesseau (1981, p. 20-47).

10. Yolanda Penteadó's "Davos 1947" notebook, Registrar's Section, MAC USP. The small notebook is the main source for describing the acquisitions made by Francisco Matarazzo Sobrinho between 1946 and 1947, in Italy and France, to form the initial collection nucleus of the former MAM of São Paulo. The collection began to take shape even before the MAM's foundation in July 1948. For an analysis of the set of Italian paintings acquired by Matarazzo, cf. Magalhães (2016).

11. *Mostra di Modigliani* – aprile maggio 1946 (1946, tavola 15).

12. Regarding Jones Netter (1867-1946), one of the leading Modigliani collectors in the Paris of the 1920s, cf. Restellini (2002, p. 409-410). On Riccardo Gualino (1879-1964) and his collection, cf. Gualino (2007), as well as the catalog of the exhibition *Dagli ori antichi agli anni venti. Le collezioni di Riccardo Gualino* (1982). Preparations for a Turin, Italy exhibition of the Riccardo Gualino collection are currently underway – we are referring to the exhibition "The Collection of Riccardo Gualino, Entrepreneur and Patron," curated by Annamaria Bava and Giorgina Bertolino, to be held from April 12 to September 8, 2019, at the Musei Reali in Turin.

13. The meeting between Riccardo Gualino and art historian Lionello Venturi took place in 1918. Venturi (1926a) later became responsible for organizing the first and only catalog of the traditional art section of the Gualino collection. At the same time, Venturi also prepared and published his book *Il Gusto dei Primitivi* (Venturi, 1926b), which proposes a new interpretation of the concept of taste, based primarily on artistic practice and technical me-

of the late 1940s and 1950s understood his work. It is worth mentioning that it was during this period that *Self-Portrait* found shelter in a Brazilian collection, while circulating in at least two international retrospective exhibitions of Modigliani's work. Thus, we will first analyze the work's arrival in Brazil, and then go on to analyze the work itself, based on the proposed comparison with the aforementioned works, on the material history of *Self-Portrait*, and on the results of the analytical techniques presented at the end of this article.

SELF-PORTRAIT: PROVENANCE, FORMAL ANALYSIS AND MAIN EXHIBITIONS

In June 1947, while travelling Europe, Yolanda Penteadó writes in her travel diary: "Modigliani purchased [in] Milan. Got [a] birthday present."¹⁰ She was referring to Amedeo Modigliani's *Self-Portrait*. The work had been acquired during the first phase of Francisco Matarazzo Sobrinho's art purchasing campaign. The campaign was intended to constitute the first collection of artworks for the Museu de Arte Moderna of São Paulo (MAM). The occasion was an exhibition by the Association of Amateurs and Cultivators of Contemporary Figurative Arts of Milan (*Associazione fra gli Amatori e Cultori delle Arti Figurative Contemporanee*), dedicated to Modigliani's work. During the exhibition, his *Self-Portrait* was displayed alongside 60 other works by the artist.¹¹

After Modigliani's death, the *Self-Portrait* was sold by Leopold Zborowski to art collector Jones Netter, in Paris. Netter then sold it to the prestigious Riccardo Gualino collection, in Turin.¹² Gualino was a wealthy investor regarded as a self-made man of the international stock market, whose collection was initially comprised exclusively of traditional art. His encounter with art critic and historian Lionello Venturi (1885–1961) was decisive in transforming his taste and making him an avid modern art collector.¹³ Thus, Venturi chose *Self-Portrait* at a time when Italian criticism was only beginning to take an interest in Modigliani's work.¹⁴ The pulverization of Gualino's collection, after his conviction for crimes of stellionate in 1929, meant that the work remained in storage in a Milanese gallery until it was acquired by another modern Italian art collector of the period: the Genoese industrialist Alberto della Ragione (1892–1973) – who donated part of his collections to the city of Florence in the aftermath of World War II.¹⁵ Prior to its purchase by della Ragione, *Self-Portrait* was supposedly offered to the Civic Museum of Modern Art in Turin, but the museum rejected it in 1937.¹⁶



Figure 1 –Visible light photograph of Amedeo Modigliani's *Self-Portrait*. MAC/ USP Collection. Image corrected using *ColorChecker*. Photo: Pedro Herzilio Ottoni Viviani de Campos; Marcia de Almeida Rizzutto.

ans. Venturi was perhaps one of the first art historians of his generation to articulate the history of traditional art with the history of modern art. On Venturi's prominent contribution to Gualino's choices, especially the latter's turn to the collection of modern art, cf. <<https://bit.ly/2YwjKHj>>. Access on: Aug. 1, 2019.

14. Venturi, on the one hand, and the Milanese critic and editor Giovanni Scheiwiller (1889-1965), on the other, played a key role in presenting Modigliani's work to the Italian art world, in the midst of the fascist era. Scheiwiller was the main contributor to the dissemination of Modigliani's life and work in the Italian environment (Rusconi, 2016; 2018), while Venturi acted as Gualino's consultant in his acquisitions of modern art, and was directly responsible for choosing the acquired works. Particularly in the case of Modigliani, the special room devoted to the presentation of his works at the Venice Biennale (curated by Lionello Venturi himself) relied largely on works from the Gualino collection, including the *Self-Portrait*. Later in this article we will specifically discuss the special room. Cf. Braun (2004, p. 200).

15. The donation is from 1969, and nowadays belongs to the Museo Novecento in Florence (website: <<https://bit.ly/2ZjvIRF>>). Access on: Aug. 1, 2019.

16. Cf. Patani (1991, cat. 348). The rejection may be related to the political rapprochments between Hitler and Mussolini and the promulgation of the so-called Racial Laws in Italy. Since Modigliani was of Jewish origin, his work would be condemned as degenerate. For an analysis of this debate, cf. Braun (2004).

Self-Portrait was featured in a Modigliani retrospective exhibition in 1946 as belonging to a private collection in Biella. The Italian public had been able to see the work only once, when a special room was dedicated to Modigliani in the 1930 XVII Venice Biennale. The room's presentation text was written by Lionello Venturi.¹⁷ Its acquisition by Matarazzo and shipping to Brazil in June 1947 contributed to gradually making an illustrious stranger out of the *Self-Portrait*. As early as the 1950s, as a part of Matarazzo's São Paulo collection, it was borrowed for two exhibitions abroad. A long hiatus ensued, and the painting was exhibited again only in 1991.¹⁸ The work came back to the international fore with the famous 2002 Modigliani retrospective at the Musée du Luxembourg, in Paris.¹⁹ In this interim (between the late 1950s and the early 21st century), however, the painting went on relatively incognito, without even so much as being reevaluated by international art historiography.

Although always present in the MAC USP galleries,²⁰ during the 1950s, *Self-Portrait* made its appearance among the Brazilian public when Yolanda Penteado lent it to the November 1949 exhibition *A nova pintura francesa e seus mestres – de Manet a Picasso* (New French painting and its masters – from Manet to Picasso), at São Paulo's MAM. It also made an appearance in the 1st Bienal de São Paulo, in 1951.

Painted on a marine 40 canvas, Modigliani's representation of himself has his figure with palette in-hand, sitting on a chair and looking beyond the limits of the frame.²¹ We are led to infer that the easel and canvas on which he is supposed to have painted the self-portrait are in front of him.²² His figure and the scene's background are comprised of large synthetic swaths of color. There is a contrast between the oval shapes of the head, the elongated trunk of the figure, and the rectangular surfaces of the background, which in theory would correspond to a wall in Modigliani's last atelier in Paris. In the virtual reconstruction of his studio promoted by the recent Tate Modern exhibition, his *Self-Portrait* is arranged on an easel facing away from the front door and towards the atelier's back wall, where large glass windows take up the space's entire left side. There is a small round table to the side of the easel. Perhaps Modigliani leaned a mirror against it, to watch himself as he painted the portrait. This thesis is corroborated by the fact that, in the painting, the artist appears holding the palette in his right hand, i.e., he would have painted using the left one. There is no record that Modigliani was left-handed, so the hypothesis that we have a specular representation of the artist's figure can be considered valid.

Yet this view is in need of a reevaluation. Firstly, even if one assumes that the left part of the background (with the two blue-greenish rectangles) corresponds to the surface of the windows, as opposed to the wall (which would correspond to the larger ochre rectangle on the bottom-right), that wall would have to be the atelier's back wall – not the side one, with its large glass windows. The position of

the artist with his easel and the position of the round table would then have to be different from those suggested by the virtual environment. Furthermore, infrared reflectography images²³ clearly reveal a thin underdrawing, making up an arch, on the bottom part of the background and to the left of the composition (Figure 2). Although this sketch was not used in the painting's final presentation, this points to two hypotheses: Modigliani might have started another composition there, painting his self-portrait over an old sketch, or he was not actually concerned with depicting the atelier's environment, and the composition's background would be his way of experimenting with colored surfaces intended to counterpose the large human figure.

This is the case with other portraits made by Modigliani between 1918 and 1919. The most evident example is *Portrait of the Artist's Wife, Jeanne Hébuterne*, painted in 1918, nowadays in the Norton Simon Museum collection in Pasadena, California (figure 3). Also painted in marine 40 format and using virtually the same color palette as *Self-Portrait*, this version of Jeanne Hébuterne's portrait can almost be considered a pair of Modigliani's. The wife's figure is also composed using oval and curved shapes, overlaid against a background consisting of two long, opposing rectangles: on the left side, the same blue-greenish rectangle seen in *Self-Portrait*; on the right side, a dark burgundy-red rectangle (the same color of Modigliani's coat), which reappears on the figure's robes and the chair she is sitting on.²⁴ Moreover, while recognizable elements of the artist's atelier – the chair, for instance – are present in both portraits, Modigliani seems to have made an effort to abstract the room. In this sense, both portraits have a narrow field of view, limiting the exposure of atelier objects and elements. Superimposed on these very synthetic backgrounds, the figures take on a sculptural and hieratic aspect. Especially in *Self-Portrait*, the volume effect of the figure's oval shapes is broken by the flattened background, treated with large transparent color surfaces.

Another relevant aspect is Modigliani's procedure for the execution of the self-portrait. Infrared reflectography imaging shows a very delicate underdrawing, used by the artist to conceive of the figure's head and physiognomy (figure 4). These lines also follow the shape of the elongated torso and are emphasized with a thin stroke of black paint, which accentuates the contours of the entire figure. However, when comparing the infrared reflectography images showing the details of the hand and palette, it becomes clear that these elements have no underdrawings. Modigliani's treatment of the head is very different from that given to the rest of the figure, especially the hands. The hand that is holding the palette, for example, is made with the thin black-paint stroke (figure 5), in a looser and less precise gesture than the one responsible for the fine lines following the face's contours. Regarding the presence of the line in *Self-Portrait*, Lionello Venturi observes:

17. Cf. Venturi (1930).

18. Cf. Patani, op.cit. We later discuss the two major exhibitions of the 1950s.

19. Cf. Restellini, op. cit.

20. While the work belonged to Yolanda Penteadó's private collection, *Self-Portrait* became part of the MAC USP collection only in 1973. After her divorce from Matarazzo and despite retaining the right of usufruct, Yolanda transferred the works that remained under her ownership to the Museum. Zanini would have the opportunity to exhibit Modigliani's work at the posthumous exhibit in honor of Francisco Matarazzo Sobrinho, between June and July 1977.

21. At the time, this canvas format (65 x 100 cm) was found in France's art supply stores. Modigliani used it recurrently in his portraits, and not for painting marines – the pictorial genre the format was originally conceived for. Modigliani positioned the canvas vertically rather than horizontally. Cf. Fraquelli, Ireson & King (2018, p. 394-395).

22. The curatorship of the 2017 Tate Modern exhibition confirms this hypothesis, even suggesting that it was one of the last works painted by the artist, shortly before his death. Cf. virtual reconstruction of the artist's studio, designed for the Tate exhibit: <<https://bit.ly/2tVVV5X>>. Access on: Aug. 1, 2019.

23. Infrared Reflectography (IRR) is a non-destructive technique that can reveal underdrawings or other hidden elements. This article's final section provides further details.

24. The end of the article provides a table of pigments used in Modigliani's work, which were succes-

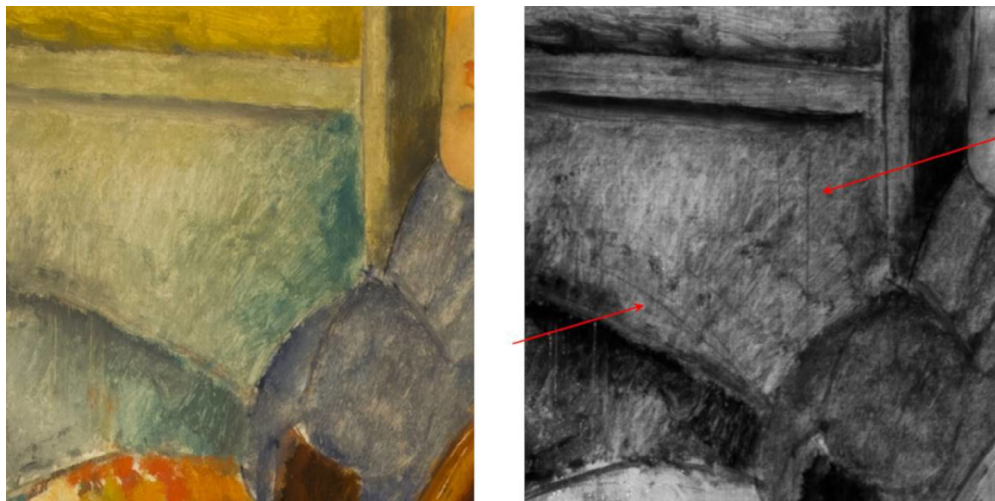


Figure 2 – Detail of the visible photograph (left) and infrared reflectography image (right) of the region near the character's face in Amedeo Modigliani's *Self-Portrait*. MAC/USP Collection. Photo: Pedro Herzilio Ottoni Viviani de Campos; Marcia de Almeida Rizzutto.



Figure 3 – Amedeo Modigliani, *Portrait of the Artist's Wife, Jeanne Hébuterne*, 1918. Norton Simon Museum Collection, Pasadena, California.

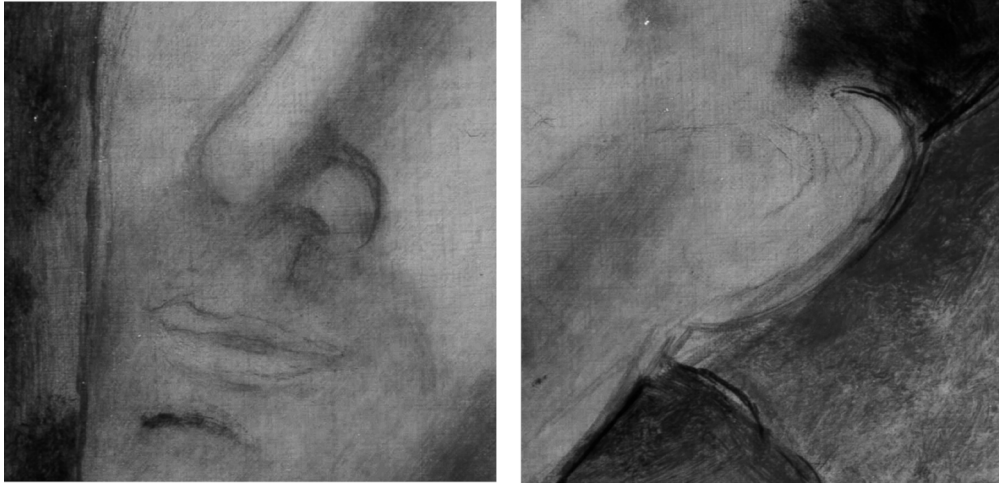


Figure 4 – Detail of infrared reflectography images of the mouth, nose and ear in A. Modigliani's *Self-Portrait*. MAC/USP Collection. Photo: Pedro Herzilio Ottoni Viviani de Campos; Marcia de Almeida Rizzutto.



Figure 5 – Detail of the infrared reflectography image showing the palette-holding hand in A. Modigliani's *Self-Portrait*. MAC/USP Collection. Photo: Pedro Herzilio Ottoni Viviani de Campos; Marcia de Almeida Rizzutto.

sfully identified via EDXRF analysis.

25. Venturi (1930, p. 117). Freely translated as follows: "... Take note of the 1919 self-portrait: tonal masses and volumes remain, but the line insinuates itself into them, fulfilling its synthetic function. The painter Mauroner once told me that in 1905, when he shared a Venice atelier with Modigliani, his friend would torment himself by trying to accomplish the line: it is not that Modigliani judged the line based on its firmness of contour; rather, he attributed to this concept a pure spiritual value, of synthesis, simplification, freedom from contingency, passion for the essential. Even at that time, in Venice, the artist regarded ancient art and the ancient line as dead letters. Then, in Paris, experiences multiplied: black sculpture, French Gothic sculpture, early Italian primitives (he seemed to love Lorenzetti in particular), Japanese art, El Greco, these and other dissenting voices of the past consolidated themselves in him: they spoke either to his ideal of generosity, or to his violence. None destroyed the Cézannian foundation of his taste, but all left a mark on him; and so, Modigliani found the relationship between the line of his imagination, an abstract synthesis, and the line of his vision, a concrete synthesis."

26. Fraquelli & Ireson, op. cit., p. 155.

27. These three versions were recently displayed on the same wall at London's National Portrait Gallery. Cf. Lewis, 2017. The exhibition ran from October 26, 2017 to November 11, 2018.

... Guardate l'autoritratto del 1919: permangono masse e volumi tonali, ma in essi si è insinuata la linea a compiere la sua funzione di sintesi. Mi ha detto il pittore Mauroner, che condivise col Modigliani lo studio a Venezia nel 1905, che allora il suo amico si tormentava per raggiungere la *linea*: non che per linea intendesse alcuna fermezza di contorno, anzi egli dava a quel termine un puro valore spirituale, di sintesi, di semplificazione, di liberazione dal contingente, di passione per l'essenziale. Allora a Venezia l'arte antica e l'antica linea gli erano lettera morta. In seguito, a Parigi, le esperienze si moltiplicarono: la scultura negra, la scultura gotica francese, i primitivi italiani (e particolarmente, a quanto pare, amava i Lorenzetti), l'arte giapponese, il Greco, queste ed altre voci discordanti del passato giunsero a lui: e l'una parlava al suo ideale generoso, e l'altra al suo senso violento. Nessuna distrusse il fondamento cézanniano del suo gusto, ma tutte vi lasciarono una impronta; e per esse Modigliani trovò il rapporto tra la linea della sua immaginazione ch'era sintesi astratta, e la linea della sua visione che fu sintesi concreta.²⁵

In this brief comment on *Self-Portrait*, in addition to indicating the presence of the line in the outline of the figure's masses, Venturi lists the artist's likely references. Those various references, however, were not enough to distance him from the main one: Paul Cézanne's painting. Indeed, there are several contemporary accounts of Modigliani's interest in Cézanne's *Boy in a Red Waistcoat* (1888–90, oil/canvas, National Gallery of Art, Washington).²⁶ The curatorship of the Tate Modern exhibition identified a set of Modigliani portraits, especially from his period in southern France (end of World War II), in which the artist would have 'practiced' by painting variations on the theme of Cézanne's work. Considering the "impact of le Midi" on Modigliani's later painted portraits, his *Self-Portrait* has important connections with Cézanne's portraits, particularly the various versions of Madame Cézanne. The three versions of Madame Cézanne in which she appears with a red dress deserve special attention. The first two now belong to the Art Institute of Chicago and to the Metropolitan Museum of Art of New York, respectively, and date from 1888 to 1890. The third, from 1890–94, is currently part of the MASP collection (figure 6).²⁷ Compared to previous versions, the latter's composition has in fact gone through a process of reworking. Cézanne completely eliminates any recognizable background element, and Madame Cézanne's figure is set against a neutral background, the armchair's back completely absent. The figure's structure is comprised of two contrasting surfaces of color, that is, her red-burgundy dress against the teal background. The MASP's version is also more translucent, with thinner layers of paint.

In *Self-Portrait*, Modigliani seems to be experimenting with Cézanne's solutions in that version of Madame Cézanne. The similarities are not only in the contrast between figure and background, but also in the fact that the figure is accentuated by large surfaces of contrasting colors (warm versus cold colors). It would be worth to compare the color palette used in MASP's version of Madame Cézanne's portrait with the color palette used in Modigliani's *Self-Portrait*, as the latter appears to employ a

similar tonal range, besides somewhat translucent layers of paint, in an attempt to achieve the transparency effect seen in the French artist's painting.



Figure 6 – Paul Cézanne. *Madame Cézanne in red*, 1890–94. MASP Collection, São Paulo.

28. The work belonged to the collection of poet and writer Joachim Gasquet, close to artists such as Cézanne and Van Gogh, and certainly an acquaintance of Modigliani. Gasquet was a central figure in the intellectual and artistic environment of Midi, where Modigliani spent the year of 1918.

29. Cf. references to the essays by Ambroise Vollard (1917) and Gustave Coquiott (1919) in the technical information sheet available at: <<https://bit.ly/2ypAprO>>. Access on: Jan. 2, 2019.

30. The energy-dispersive X-ray Fluorescence and Raman Microscopy spectroscopic techniques are further detailed in the last part of this article.

31. In addition to the results presented later in this article, cf. Fraquelli, Ireson & King (2018, p. 407), especially in regard to comparisons between *Self-Portrait*, another portrait of Jeanne Hébuterne (currently in the collection of the Metropolitan Museum of Art), and *Portrait of a Young Woman* (1918-19, oil/canvas, Yale University Art Gallery).

32. *Self-Portrait* underwent two relining processes and one restoration (1983). The painting was done on a finer-weft canvas, which was later cut at the edges and glued (with rabbit glue) onto a second canvas. The use of this type of technique suggests that the relining was performed while the work was still in Italy. Moreover, this was the frame with which the work arrived in Brazil. Cf. the photograph of *Self-Portrait* displayed during the exhibition Modigliani Paintings, Drawings, Sculpture, at MoMA, New York, April-June 1951, available at: <<https://mo.ma/2YrXepz>>. Access on: Aug. 1, 2019. The same frame remains in the work to this day. The 1983

We may never know if Modigliani had the opportunity to see this specific version of Madame Cézanne's portrait.²⁸ However, the question here would not be whether the Livorn painter studied this specific Cézanne portrait, but rather how he grasped the general principle or procedure behind Cézanne's execution of the various versions of Madame Cézanne. In this sense, throughout the trajectory that starts with the portrait currently in the Art Institute of Chicago, passes through the one in the Metropolitan Museum in New York, and finally arrives at the one in the MASP, Cézanne carried out a process of synthesizing the elements of composition and color palette. This process closely resembles Modigliani's attempts in his portraits of Jeanne Hébuterne and in his self-portrait, as well as other portraits from 1918-19. Moreover, the versions of Madame Cézanne's portrait were frequently mentioned by the period's critics. The version now in the Metropolitan Museum participated in the large 1907 Cézanne retrospective at the Salon d'Automne, and was frequently referred to and evaluated by critics in the 1910s.²⁹

Regarding the colors employed by Modigliani, one of the questions we asked during the technical-scientific analysis was whether the palette held by the painter in the self-portrait contains the same pigments as the composition as a whole. The Energy Dispersive X-ray Fluorescence (EDXRF) and Raman Microscopy³⁰ analyzes answered positively, also showing that the artist's palette is quite economical and comparable to that of his other portraits and works.³¹ This means that, both in terms of canvas preparation base and pigments, Modigliani made recurrent use of a few pigments. In *Self-Portrait*, the artist seems to have reused the same brush for applying different colors. The EDXRF spectra show the presence of elements that are not found in the painting's main pigments, suggesting remnant traces of other pigments, i.e., Modigliani likely used a "dirty" brush to paint the portrait.

The Raman microscopy analyzes were initially intended to determine whether the pigment binder was oil or tempera. Due to the thick layer of Dammar varnish applied to the painting surface (Figure 7), no conclusion could be reached in this regard.³² However, one of the samples was identified as containing Prussian blue, a recurrent pigment in other Modigliani works that had not been detected in EDXRF analyzes.

Leopold Zborowski's portrait in the MASP collection (figure 8) is another Modigliani work that seems to corroborate this assessment of the procedures adopted in *Self-Portrait*.³³ The work's composition was conceived according to the same patterns of the self-portrait and other Modigliani portraits of the period, especially Jeanne Hébuterne's.³⁴ On the one hand, Camesasca suggests that

the 1919 dating for *Portrait of Leopold Zborowski* is incorrect, precisely because of the door in the background and on the right side of the composition, which reappears in one of the versions of Jeanne Hébuterne's portrait.³⁵ On the other hand, the version showing only Leopold Zborowski's bust, now in the hands of the Barnes Foundation and dated 1919, is very similar to the MASP version. The MASP version is also assumed to be from 1919.³⁶ Thus, there is a close relationship between the versions of Jeanne Hébuterne's portrait, the two abovementioned portraits of Leopold Zborowski, and the *Self-Portrait*, confirming that this set of portraits was made between 1918 and 1919. The recurrence, again, of the marine 40 format in some versions of Jeanne Hébuterne's portrait, in MASP's Leopold Zborowski portrait, and in the *Self-Portrait*, together with the treatment given to the relationship between figure and background, and finally the artist's palette in all these works seem to indicate that, for Modigliani, they were answers to a single painting problem. In this investigation, the artist may have been led to establish a dialogue with the versions of Madame Cézanne's portrait, especially the one currently in the MASP collection.

The comparison between MAC USP's Modigliani and MASP's portraits of Leopold Zborowski and Madame Cézanne may shed light on the context that led these works to be included in these Brazilian collections, clarifying what view of Modigliani's work this context assumes. In the initial study on Matarazzo's acquisitions for the creation of São Paulo's MAM, the actions of two intermediaries were effectively identified: Pietro Maria Bardi and Margherita Sarfatti.³⁷ Considering that *Self-Portrait* was acquired during the 1946 Milan retrospective exhibition in honor of the artist, it can be inferred that the work's purchase would also have been intermediated by Bardi, a confirmation of the critic's relationships and taste.

Modigliani would certainly not have been a choice of Sarfatti or her intermediaries. Sarfatti linked Modigliani's work to the Paris School, distancing it from the Novecento Italiano.³⁸ In this sense, Sarfatti likens the work of the Livorno artist to that of his Parisian countryman, Chaïm Soutine.³⁹ Even so, her critical appraisal of Modigliani's painting concludes by suggesting that the artist's lines are a direct heritage of the Quattrocento tradition: "... Modigliani tiene en su pintura, y particularmente en sus dibujos, tenues como un hilo de seda, hierentes como el filo de la navaja, la precisión delicada y viva de los toscanos del *Quattrocento*, con la misma soberana pureza"⁴⁰ In this regard, her stance is contrary to Venturi's, who in 1930 spoke of the artist's synthetic line.⁴¹

restoration essentially performed two interventions: a second relining (preserving the original frame), and the removal of the varnish layer, which was replaced by Dammar varnish. See the February 22, 1983 restoration report signed by restorer Thomas Christian Brixia (archives of the MAC USP painting and sculpture laboratory). See also C. Richard Johnson, Don Johnson, and Robert Erdmann's report on the type of fabric used in the MAC USP canvas, as part of Rice University's Thread Count Project (USA). The report was requested by Tate Modern, and lies within the scope of the material investigation of Modigliani's work. Fraquelli, Ireson & King (2018, p. 186).

33. A controversy surrounds the dating of "Portrait of Leopold Zborowski". The general catalog of the MASP collection settles for a very wide date range (1916–19), which comprises almost the entire period of Modigliani's coexistence with his friend and patron (cf. <<https://bit.ly/2MnCDjH>>). Access on: Aug. 1, 2019. Camesasca (1988, p. 272) attributes a date between 1916 and 1917 – i.e., starting in the first phase of the friendship between Zborowski and Modigliani, and before his period in Midi. Patani (1991, cat. 322) proposes 1919 – the same year the *Self-Portrait* was conceived – as the year the work was conceived. Restellini (2002, p. 370) corroborates Patani's dating. Fraquelli & Ireson (2017, p. 192) opt to refer to the date range provided by MASP (1916 to 1919).

34. In addition to Hébuterne's portrait in the Norton Simon Museum collection, the versions that currently belong to the Solomon Guggenheim Museum (Patani, 1991, cat. 229), to the Barnes Foundation (Patani, 1991, cat. 274),



Figure 7 – Ultraviolet-induced visible fluorescence photography of A. Modigliani's *Self-Portrait*. MAC/USP Collection. Photo: Pedro Herzilio Ottoni Viviani de Campos; Marcia de Almeida Rizzutto.



Figure 8 – Amedeo Modigliani. *Portrait of Leopold Zborowski*. MASP Collection, São Paulo.

to the Metropolitan Museum of Art (Patani, 1991, cat. 338), and to the Ohara Museum of Art (Patani, 1991, cat. 340), as well as a version that seems almost as a variation of the Barnes Foundation portrait, which belongs to a private collection (Patani, 1991, cat. 276), all are based on the principle of figure vs. background counterposition. The background is comprised of large swaths of translucent and contrasting colors. One of these (Patani, 1991, cat. 276) is a variation of the portrait in the Norton Simon Museum, including the same color palette. The version that belong to the Barnes Foundation and its private-collection variety were painted using the marine 40 format, as well as MASP's *Portrait of Leopold Zborowski*.

35. Cf. Camesasca, op. cit.

36. Patani (1991, cat. 321) and the Barnes Foundation website: <<https://bit.ly/2YutXul>> Access on: Aug. 1, 2019.

37. Magalhães (2016, p. 67-69).

38. Sarfatti (1947, p. 136-137).

39. Ibid. Sarfatti even suggests that their approximation was due to their common Jewish cultural identity. Her approach to analyzing Modigliani's work was quite different from that of her contemporary, Lionello Venturi, for example, and from the approaches of other critics, such as the Italian Giovanni Scheiwiller, or even the (anonymous) author of the catalog presentation text for the 1946 Modigliani exhibition.

40. Ibid. Freely translated as follows: "Modigliani has, in his painting, and particu-

The strategy of bringing Modigliani closer to the Italian *Quattrocento* tradition was adopted by some Italian critics in the second half of the 1940s. This influenced his work's reception by the North-American environment, especially after the 1949 MoMA exhibition *Twentieth Century Italian Art*. James Thrall Soby – who wrote about Modigliani in the catalog of this exhibition – then became curator and catalog author for the *Modigliani Paintings, Drawings, Sculptures* exhibition, also held in the MoMA between April and June 1951.⁴² The Matarazzo couple and the MASP loaned the Modigliani artworks in their respective collections to the MoMA.⁴³ Based on a selection of portraits and nudes in Modigliani paintings, drawings and sculptures, Soby refers to the nudes as suggestive of Modigliani's link with modern French painting.⁴⁴ The portraits, however, would have been an expression of the artist's "mannerism" and traditional Italian roots. Thus, Soby (1951, p. 9) begins his text for the catalog as follows:

Of facts pertaining to Modigliani's career, none is more singular than that he should have been so direct an heir to the Renaissance and Mannerist painters of his native Italy. He was separated from them by generations of artists, fluent and important at first, dwindling to cautious provincialism in the century preceding his own.⁴⁵

Contrary to the thesis defended by Venturi in the special room dedicated to the artist in 1930, the arrangement of the paintings seen in the 1951 exhibition's photographic records has Modigliani's portraits effectively arranged to compose "the gallery of an era and of a world, the last real Bohemia" (Soby, 1951, p.10). No emphasis is placed on the *Self-Portrait*.⁴⁶

On the other hand, despite its proximity to the US environment, Brazil's collections only have Modigliani portraits. Between 1951 and 1952, Bardi completed the MASP's final Modigliani collection, with the acquisition of five more portraits from different moments in Modigliani's career, including *Portrait of Diego Rivera* (1916, oil/cardboard, 100 x 79 cm). This portrait is the most clearly associated with the Parisian international context – i.e., with so-called primitivism and the artist's first experiments in Paris. The others, together with *Portrait of Leopold Zborowski* and *Self-Portrait*, are part of Modigliani's pictorial research and, in this sense, show a clear approximation to Cézanne's portraiture.

In any case, *Self-Portrait* does not explicitly refer to the Italian tradition. This is clear in the procedures adopted by the artist for the portrait's execution, including the composition of the figure and of the area that joins the body and the head. Modigliani's head is tilted and seems to rest on his trunk, the overall figure seemingly a combination of two oval shapes. Given the figure's thin, elongated features, this could very well allude to the abstracting, shining heads of Brâncusi – with whom Modigliani learned to sculpt.

Although part of the period's critique construed Modigliani's image as an artist who had "updated" the artistic tradition of his country, another critical tendency sought to rescue the aspects of his work that linked him to the Paris School and to Cézanne, mainly based on Venturi's interpretations. This is the case of the review published by Mário Pedrosa in *Jornal do Brasil*, on May 29, 1958. Here, Pedrosa is appraising the retrospective exhibition organized by Galerie Charpentier, in Paris, in which *Self-Portrait* was exhibited:

Na Galeria cheia de gente, mulheres elegantes, homens de chapéu caro, burgueses ricos e pequenos, burgueses sentimentais, a 'posteridade', enfim, lá está para glorificar o pintor sacrificado e enriquecer ainda mais os espertos marchands que, ao jogar na bolsa de valores artísticos, compraram na baixa para vender na alta, às custas da vida mesma que ora endeusam. Diante dos mais tristes e belos retratos e bustos de Modigliani, inclusive os vários autorretratos e retratos de sua Jeanne, os snobs ricos e envelhecidos de sua geração, com os filhos exultavam. A burguesia descobria o gênio morto, com um trágico atraso.

Essas reflexões amargas nos vinham à mente, quando visitávamos a mostra. E, então, verificávamos que um novo equívoco estava surgindo ali mesmo: o que aquela gente admirava era a elegância, o maneirismo, certo que snob aparente em várias daquelas obras. **O Modigliani, filho de Cézanne e dos fetiches negros, irmão mais moço de Brancusi**, com a beleza incomparável de sua assimetria de desenho, com o ritmo quase soluçante de sua linha, com suas sombras delicadas e moventes que chegavam para sustentar, de leve, a pureza nervosa dos contornos, **com a intransigência de sua simplificação formal, nascida nas fontes da arte moderna, isto é, em Cézanne, e nas fontes da arte eterna, isto é, nos fetiches negros, esse – poucos o viam** [my emphasis].⁴⁷

In analyzing Modigliani's painting, Pedrosa emphasizes the artist's connection with Cézanne, Brâncusi and the African sculpture. His argument is reminiscent of Venturi's presentation for the special room in the 1930 Venice Biennale. Venturi's "line of synthesis" is what Pedrosa calls the "intransigence of [the contour's] formal simplification." In the very materials of the *Self-Portrait*, Modigliani shows us a glimpse of his way of working with drawing and his use of these references. Thus, the Venturian critique taken up by Pedrosa is the one to actually see and scrutinize the painting.

larly in his drawings, as subtle as a silk thread, as sharp as a razor's edge, the delicate and vivid precision of the Quattrocento Tuscans, with the same sovereign purity." Thus, she emphasizes Modigliani's connection with the classical tradition of art, suggesting approximations between him and Botticelli.

41. Venturi (1930, p. 117) explicitly speaks of the artist's overcoming of the line of the Old Masters: "Allora a Venezia l'arte antica e l'antica linea gli erano lettera morta" [Even at that time, in Venice, the artist regarded ancient art and the ancient line as dead letters].

42. Cf. Soby (1951).

43. *Portrait of Leopold Zborowski* was borrowed from MASP. At the time (1950), it was the only Modigliani in the museum's collection. The others were bought by the museum between 1951 and 1952.

44. Cf. Soby, op. cit, p. 13-14, in which the critic relates Modigliani's nudes to Manet's *Olympia*.

45. Id., p. 9. Soby's position is certainly in line with Margherita Sarfatti's. Both points of view, in a way, can be seen as a reflection of the Italian *soft power* campaign to reintroduce Italian art in the international circuit. In this context, an artist like Modigliani played a key role. His rehabilitation after the fall of fascism was an important strategy for the rehabilitation of the Italian artistic and cultural environment in the eyes of the international cultural scene. Cf. Soby & Barr, 1949.

46. Soby, op. cit., p. 10. The exhibition's photographic record can be viewed at: <<https://mo.ma/2y19bCH.>> Access on: Aug. 1, 2019.

47. Cf. Pedrosa (1958). Freely translated as follows: "In the crowded Gallery, elegant women, men with expensive hats, bourgeois rich and petty, sentimental bourgeois, 'posterity,' anyway, there they are, to glorify the sacrificed painter and further enrich the clever *marchands* who, playing their luck in the stock market of artistic values, bought low to sell high, at the expense of the very life they now deify. Faced by Modigliani's saddest, most beautiful portraits and busts, including the various self-portraits and portraits of his Jeanne, the rich and old snobs of his generation rejoiced, their children by their side. The bourgeoisie was discovering the dead genius after a tragic delay. These bitter thoughts came to our minds as we visited the exhibition. And then we noticed that a new misconception was emerging, right then and there: what these people admired was elegance, mannerism, [that is,] the snobbish element in many of those works. The Modigliani who was the son of Cézanne and of the black fetishes, who was Brancusi's younger brother, with the incomparable beauty of his drawing asymmetry, the almost trembling rhythm of his line, his delicate, moving shadows arriving to support, lightly, the nervous purity of the contours, with the intransigence of their formal simplification, born in the sources of modern art, that is, in Cézanne and in the sources of eternal art, and in the black fetishes, that Modigliani – few saw him."

In this sense, the analytical techniques employed here were fundamental for understanding and interpreting Modigliani's procedures. The line drawn in graphite, the reinforcing of the black line using a thin brush, the a posteriori filling in of colors: all were instrumental in the composition of *Self-Portrait*. The similar execution procedures of the paintings, as well as the recurrence of the pigments and the canvas format, can also be observed in other cases analyzed here, as well as in the technical research project of the artist's works undertaken by Tate Modern, in 2017.

Furthermore, these techniques were invaluable for establishing a comparison with MASP's *Madame Cézanne*. Some elements of Cézanne's procedures are very similar to Modigliani's. Besides the similarities that we have already pointed out, Cézanne's application of pigment in thin layers reveals vertical lines, in the background and under the painting, which were probably made using graphite. These lines closely resemble the arches drawn by Modigliani, which in *Self-Portrait* were subsequently covered by layers of paint. Although Cézanne does not seem to use graphite to draw the figure, he does use a thin brush to apply the black color, emphasizing the figure's contours. Finally, a detail of *Madame Cézanne's* right-hand reveals lines of a more imprecise character, and two almost monolithic patches of color. These features seem reminiscent of the way Modigliani paints his own hands, although his execution of this part of the composition might have been done more hastily. Details like these, although partially visible to the naked eye, could be effectively corroborated and verified using the analytical techniques employed here.

In the following section, we present the complete results of the study of the artist's palette and other material data identified using technical-scientific analyzes. We also provide a description of the employed techniques and discuss what kind of information they can provide about a painting.

ANALYTICAL TECHNIQUES

This project employed analytical methodologies involving two imaging techniques: Energy Dispersive X-Ray Fluorescence (EDXRF) and Raman Microscopy. Below is a presentation of these techniques, followed by final considerations on our findings.

Imaging analyzes

Imaging techniques are important forms of documentation, registry and study of artistic heritage. They provide reliable information, generating a unique and characteristic data set. Thus, they make up documents that become associated with the works themselves, used especially for their conservation and for monitoring their history of restorative interventions.

Visible Light – allows for a registry of the work in its color palette and stylistic details. The system consists of a high-resolution digital camera and several lenses, resulting in a faithful reproduction of the work, especially in terms of color registration, by using a color table (Color Checker) with known RGB (Red, Green and Blue) values.⁴⁸

Raking Light – In this technique, tangential light projected on the work is used to highlight features such as reliefs, brush strokes, surface roughness, etc.

Ultraviolet Induced Visible Fluorescence Photography (UV) – Photographic technique used to record the UV-fluorescence of certain substances on the painting. Fluorescence occurs due to a given material's interaction with UV radiation. Thus, one can obtain superficial information on the pictorial layer, detecting polychromatic anomalies and retouched areas – especially when it is difficult to distinguish between retouching and the original painting – as well as possible materials used by the artist. Areas of retouching, restoration and recent intervention are visible by their different levels of fluorescence, which appear as different bluish tones. If the varnishes that cover the work are too old and thick, a greenish fluorescence will be produced when UV rays are projected onto the painting.

Infrared Reflectography (IRR) – Infrared reflectography photography is a non-destructive technique to obtain images through a digital camera (Osiris) operating within the 900 to 1700 nm spectral range. The observed image results from a combination of reflection, absorption and transmission of the superficial layer, revealing otherwise hidden details and lines. The visualization of under drawings depends on two aspects: contrast and transparency.

Contrast is related to the drawing's material and its reflectance in comparison to the preparation base. Transparency is related to the pictorial layer and depends on the composition of the pigments. Carbon-based drawing mediums have a high infrared absorption, increasing their reflectance delta in relation to the preparation base. In these cases, the drawing is clearly visible even when the pictorial cover is not highly transparent.

48. Color Checker is a chart containing reference values for each color. It enables the identification of objects' colors from their photographic reproductions.

Energy-Dispersive X-Ray Fluorescence (EDXRF)

X-ray Fluorescence (XRF) is a non-destructive analysis technique that has been widely used to investigate and identify the chemical elements present in the materials of different cultural-historical heritage objects. The analyses performed here employed a portable system consisting of a silver anode X-ray tube and a Si-Drift semiconductor X-ray detector, both from Amptek®.

In this analysis, an X-ray beam is used to excite the atoms of an object's materials. During de-excitation, characteristic X-rays are emitted by atoms, collected by the detector, and processed to generate X-ray spectra pointing to chemical elements, which can be identified and even quantified, if needed. This type of analysis is non-destructive because measurements can be performed by positioning the equipment close to the analyzed object, without quite touching it (Figure 9).

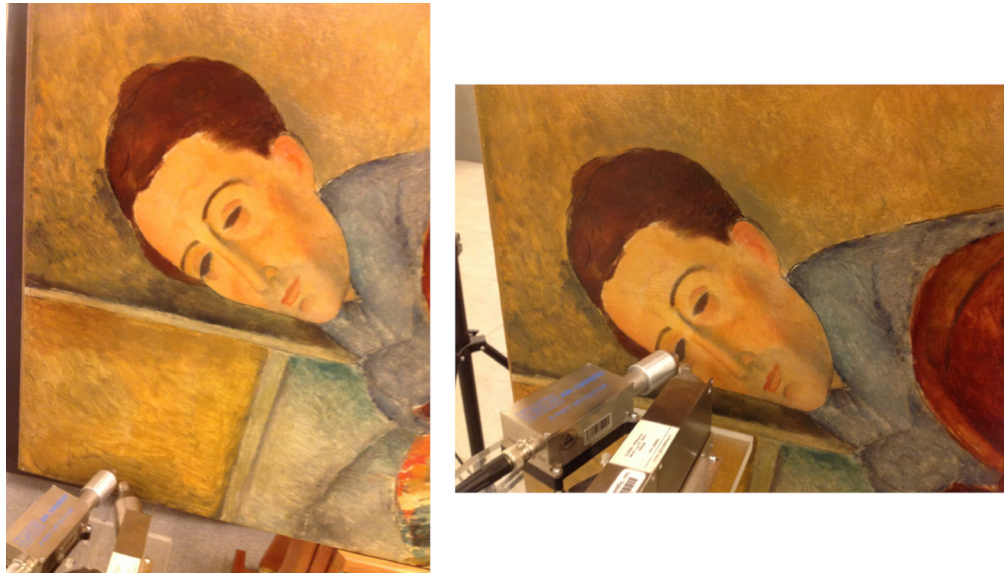


Figure 9 – Photo showing the EDXRF system being used to measure pigments in A. Modigliani's *Self-Portrait*. MAC/USP Collection. Photo: Pedro Herzilio Ottoni Viviani de Campos; Marcia de Almeida Rizzutto.

Raman Microscopy

Raman microscopy is a non-invasive and non-destructive molecular characterization technique based on inelastic light scattering. It does not require physical contact with the object under analysis: the analysis is performed by a low-power laser beam focused through the objective lens of a microscope into extremely small areas of interest (typically 1 to 4 μm^2). This makes it possible to perform analyzes in a virtually non-invasive manner. Even when sample collection is required, only very small quantities are necessary, with no aesthetic or physical impact on the object under analysis. These characteristics allow the technique to stand out among other methods employed in the study of cultural heritage.

Analyzes were performed on a Raman Renishaw inVia Reflex Microscope (Figure 10) using various lasers (532 nm, 632.8 nm and 785 nm) and a thermoelectrically cooled CCD detector. Due to the impossibility of removing the work from the museum environment, micro-fragments (smaller than one third of a hair) were collected from selected areas of the painting, using small-diameter hypodermic needles. Fragments containing pigments and dyes adhere to the needle tip, which is then placed on the Raman microscope slide (Figure 11).



Figure 10 – Raman microscope used in this study's Raman analysis. Photo by the authors.

Results and discussions of analytical measures

Imaging

Imaging measurements made with visible light, raking light, visible UV-fluorescence, and infrared reflectography provided a wealth of information on the registration, conservation status and creative process of Amedeo Modigliani's *Self-Portrait*. Visible light photography (figure 11) reveals details of the color palette used by the artist. The comparison of images made with visible light, IRR, UV and raking light (figure 12) shows details of the artist's pencil strokes, and also emphasize the contours of the thin black-ink strokes, the thick layer of varnish seen with UV light, and the work's relatively plain relief, which indicates a thin layer of paint.

The artist's signature is very similar to that on *Madame Z* (1918, oil on canvas, 54 x 37.5 cm², Birmingham Museums Trust). Its ink is thicker than the signature on *Le Petit Paysan* (1918 ca., oil on canvas, 100 x 64.5 cm², Tate Modern, London). Its pigment is probably calcium-based (see EDXRF results). The different imaging techniques (exemplified in figure 13) showed no changes or interventions in this area.



Figure 11 – Sample positioned for Raman spectra analysis. Photo by the authors.

It is worth noting that there is a great contrast between the figure's head and hands. The head is much more detailed, with images of graphite traces on the face – nose, mouth, ear – while the hands are made of looser strokes without much precision or detail (figures 14, 15 and 16).

We also observed the marking of a stamp on the back of the canvas (macro image in figure 17). After image processing, we were able to identify the stamp as belonging to French customs (other details are illegible). We can also observe the weaving of the fabric on the back, which belongs to the canvas used for relining the work in 1983.

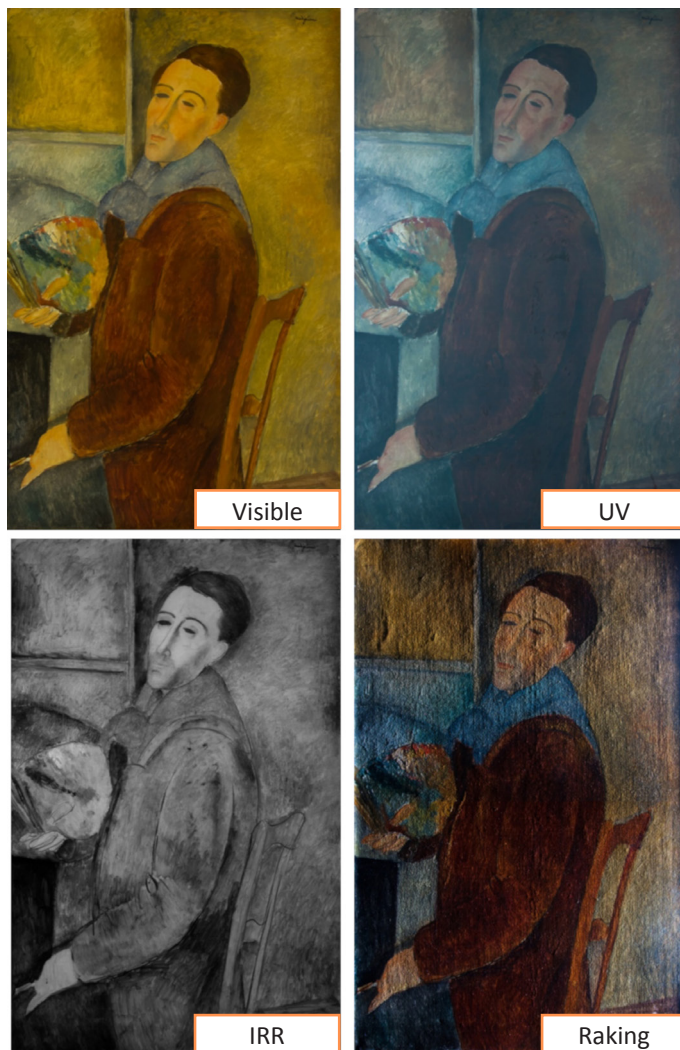


Figure 12 – Photographs of A. Modigliani's *Self-Portrait* (in clockwise direction): visible light, ultraviolet, infrared, and raking light. MAC/USP Collection. Photo: Pedro Herzilio Ottoni Viviani de Campos; Marcia de Almeida Rizzutto.



Figure 13 – Photographs with details of the signature on A. Modigliani's *Self-Portrait* (in clockwise direction): visible light, infrared, ultraviolet and raking light. MAC/USP Collection. Photo: Pedro Herzilio Ottoni Viviani de Campos; Marcia de Almeida Rizzutto.

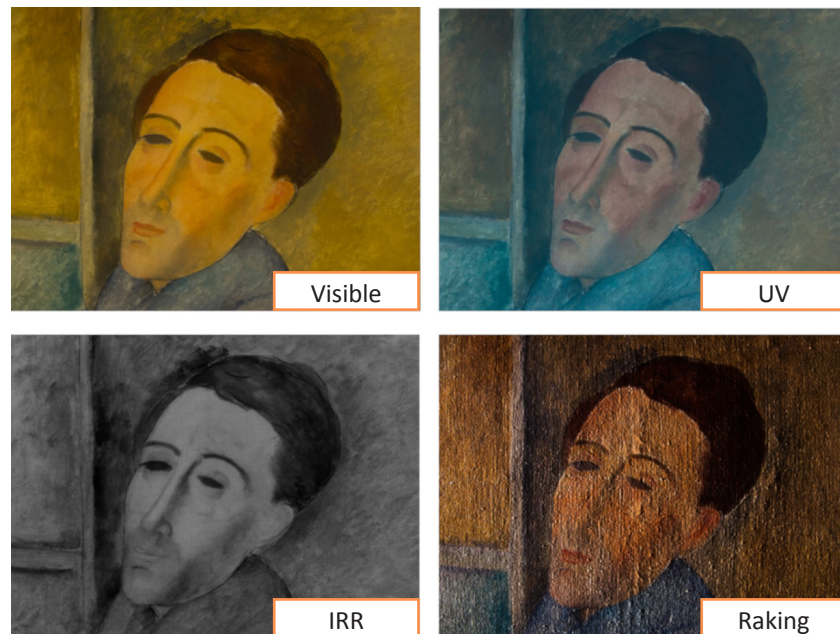


Figure 14 – Images detailing the figure's face in A. Modigliani's *Self-Portrait* (in clockwise direction): visible light, ultraviolet, infrared and raking light. MAC/USP Collection. Photo: Pedro Herzilio Ottoni Viviani de Campos; Marcia de Almeida Rizzutto.



Figure 15 – Images detailing the figure's palette-holding hand in A. Modigliani's *Self-Portrait* (in clockwise direction): visible light, ultraviolet, infrared and raking light MAC/USP Collection. Photo: Pedro Herzilio Ottoni Viviani de Campos; Marcia de Almeida Rizzutto.

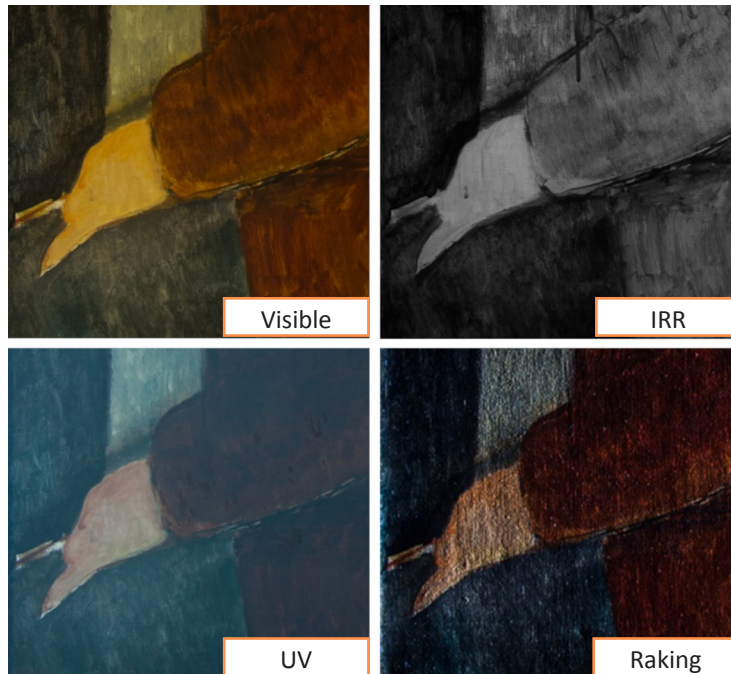


Figure 16 – Images detailing the left hand in A. Modigliani's *Self-Portrait* (in clockwise direction): visible light, ultraviolet, infrared and raking light. MAC/USP Collection. Photo: Pedro Herzilio Ottoni Viviani de Campos; Marcia de Almeida Rizzutto.



Figure 17 – Processed visible light macrophotography of the back of the work, showing a French customs stamp and the weaving of the back fabric of A. Modigliani's *Self-Portrait*. MAC/USP Collection. Photo: Pedro Herzilio Ottoni Viviani de Campos; Marcia de Almeida Rizzutto.

Energy-Dispersive X-Ray Fluorescence (EDXRF)

In order to perform the measurements, the EDXRF portable equipment was set to 30 kV voltage and 10 μ A X-ray-tube current, at 100 s per irradiated point. Measurements were taken on a total of 67 different-color points (Figure 18).

Typical spectra of EDXRF measurements can be seen in Figure 19 for points P62 (ocher pigment, upper-left corner) and P59 (black pigment, right eye). All measured spectra indicate a large amount of lead and smaller amounts of calcium (Ca), iron (Fe), barium (Ba), chromium (Cr), zinc (Zn), mercury (Hg) and titanium (Ti) at the restoration points (identified by UV photography). Data systematization was performed from the peak areas of the different spectra, presented as bar graphs (Figure 20). The points were divided into colors: brown, dark green, light green, teal, greenish yellow, ocher, gray, yellow (carnation), red, white, gray and black, and into the last three points: canvas edge, metal thumbtack, canvas back.



Figure 18 – Points measured while applying the EDXRF technique to A. Modigliani's *Self-Portrait*. MAC/USP Collection. Photo: Pedro Herzilio Ottoni Viviani de Campos; Marcia de Almeida Rizzutto.

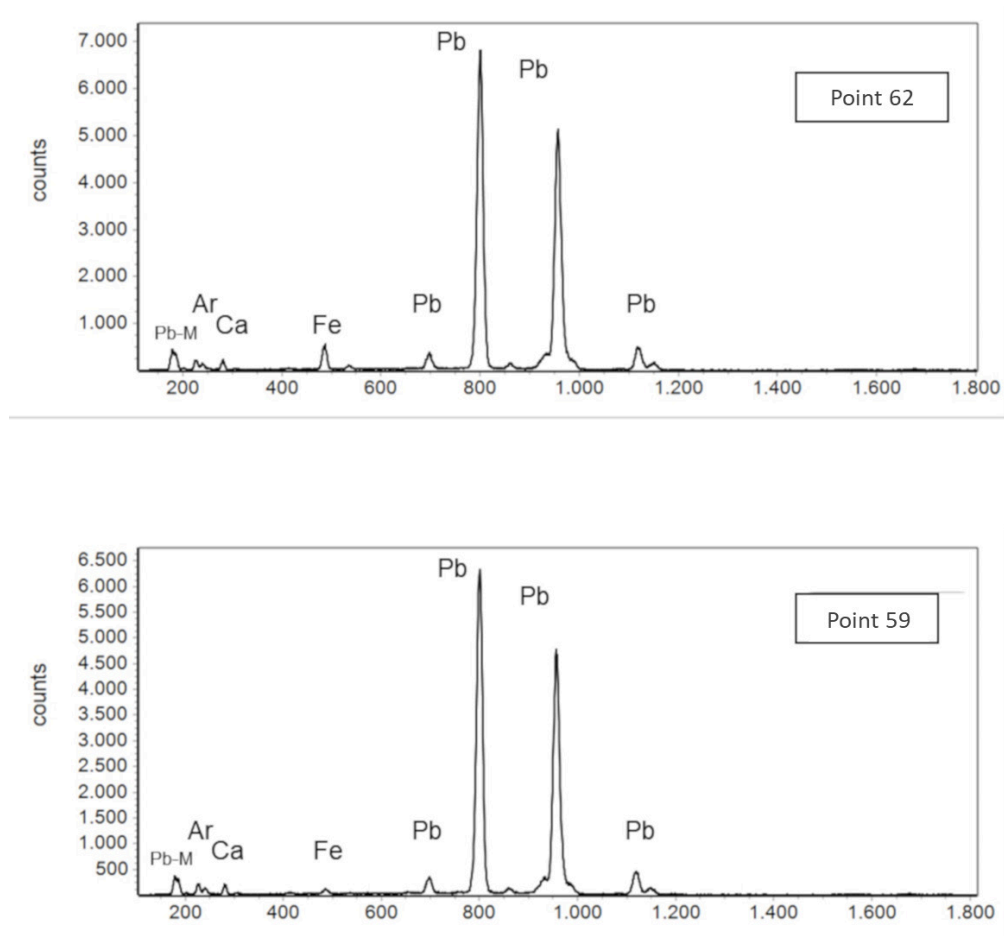


Figure 19 – Typical EDXRF measurement spectra for points P62 (ocher pigment, upper-left corner) and P59 (black pigment, right eye). Work: A. Modigliani's *Self-Portrait*. MAC/USP Collection.

The bar graph for the lead element shows that it is systematically distributed over all points. This suggests that this element is related to the white lead pigment used in mixtures and in other pigments. We can thus infer that white lead was the canvas' preparation base. Point P12 has a higher amount of lead, as it lacked varnish. As seen in points P41 and P42, points with lower amounts of lead are suggestive of a thicker paint layer, as in the case of the palette area. Point P65 has no lead, confirming that the side (reinforced edge) has no lead preparation. Point P66 also has no lead, as it corresponds to the metal thumbtack. The smaller amount of lead on the back of the canvas (P67) is due to the unleaded relining screen.

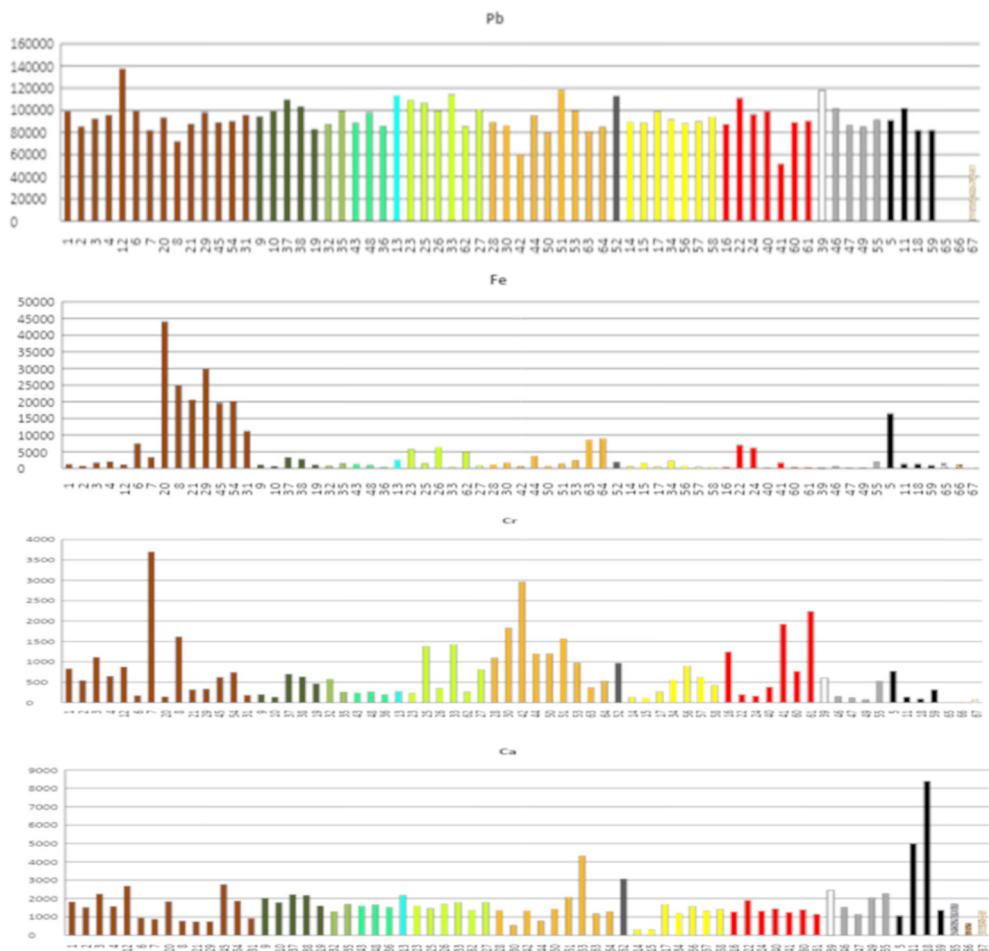


Figure 20 – Bar graphs of the spectral areas for the elements lead, iron, chromium and calcium, respectively, as detected by EDXRF in A. Modigliani's *Self-Portrait*. MAC/USP Collection.

Mercury is associated with the following colors, areas and points: brown (P1, P2, P3, P4, P12), ocher (P42) and palette reds (P40 and the more intense P41); the mouth and ear (P60 and P61), and palette dark green (P37 and P38). The presence of this element suggests the use of vermilion cinnabar pigment (HgS).

Iron is the main element present in browns (P20, P8, P21, P29, P45, P54, P31), ocher (P63 and P64), the chair's reds (P22 and P24) and the chair's black point (P5). These likely correspond to a hematite (19th century synthetic pigment) or ocher/goethite (mineral) iron-based pigment. Calcium is most present in P52 (letter G of the signature), in the P53 point above the signature, in P11 (restoration area) and in P18

49. In contemporary restoration procedures, conservators use non-original materials as a marker of their interventions – so that future generations may correctly assess the original materials used in a work and identify its history of restorative interventions.

(black – supposedly a bone black pigment). The barium element is present in the dark green points (P37 and P38) and in the brown, ocher and red points (P40 and P41). In the latter two it is associated with mercury (perhaps used in the red pigment).

The manganese element is present only at points P20 and P21, which correspond to the sleeve and coat browns. The chrome element is most densely present at points P7 (brown), P41 and 61 (red) and P42 (ocher), perhaps suggesting a mixture containing chrome-based pigments such as chrome yellow or zinc yellow, as well as chrome red.

The zinc element is present in greater amount on the lower-right corner points (P1, P2, P3, P4 and P12 – brown dots) and at the upper-right corner points (P50, P51 and P53 – ocher dots), suggesting zinc-based pigments (zinc yellow). We should also note that all measured points have a constant amount of zinc.

Finally, titanium was only identified at the points P53 (ocher, above the signature, on the edge), P56 (carnation spot in the figure's face) and P11 (dark spot in the figure's trousers, in the bottom area near the edge). All these points were identified by UV and by the MAC USP restoration technician as restoration points, showing that the restoration used a mixture of titanium pigments (titanium white).⁴⁹

Raman microscopy

Typical Raman spectra of the painting's colorants are shown in figure 13. As this is a microscopic analysis, pigments of different colors can be found in samples collected from areas that did not appear to possess such diversity, revealing paint mixtures and the specific chemical compositions of each paint.

The analyzes allowed for the identification of several pigments, as detailed below.

White pigments – White lead – basic lead carbonate (PbCO_3)₂.PbO – was found in several samples. This pigment was widely used until the twentieth century. In the analyzed work, its uses included the preparation of canvases, as a filler in paint formulations, and as a drying agent in finishing varnishes. Titanium white (anatase, TiO_2), zinc white (zinc oxide, ZnO) and lithopone (mixture of barium sulfate and zinc sulfide) were not identified, even though they are good light scatterers. As discussed above, the presence of zinc detected by EDXRF is probably related to zinc chromate yellow pigment (ZnCrO_4). A low intensity band

at 1.009 cm^{-1} , characteristic of calcium sulfate dihydrate (gypsum), is observed in some spectra, which may explain the detection of calcium by EDXRF.

Black pigments – In the case of black pigments, only charcoal (amorphous carbon) was found, as shown by the broad bands D (1.330 cm^{-1}) and G (1.600 cm^{-1}) identified in the spectra of pigments of this color and also in mixtures with other pigments, observed in darker-colored areas on the screen, such as browns. Amorphous carbon pigment can be prepared in many ways and hence the pigment has many names, one of which is bone black. However, in this case (and also for ivory black) we would see a characteristic band corresponding to the phosphate groups that exist in bone hydroxyapatites (carbonated calcium hydroxyphosphate). This was not observed here, which is why the presence of bone black can be ruled out.

Red pigments – The following red pigments were unambiguously identified: hematite (Fe_2O_3), vermilion (HgS) and basic lead chromate (PbCrO_4 . PbO , which, depending on the pigment preparation, may also have an orange coloration). In painting, these pigments are very often mixed. Thus, the spectra show vermilion bands along with basic lead chromate bands and, considering that the analysis takes place at a micrometer level, this means that individual components were fully mixed, probably during the paints' manufacturing. These reds are also present in brown areas of the frame, mixed with the black pigment.

Brown pigments – Analysis of brown colored areas specifically revealed a mixture of various pigments, such as reds, yellows, and orange mixed with black. No manganese-based pigment was found. However, manganese can be difficult to observe, and the decision not to carry out an extensive collection of canvas pigments (aiming at their preservation) may have contributed to it not being detected, especially when considering the technique's microscopic characteristic, combined with the fact that manganese oxides are poor light scatterers. In this sense, the EDXRF analysis showed manganese only at a few points, and in low concentration. Its limited detection and low intensity in the EDXRF spectra lead us to question the significance of its detection in the elemental analysis.

Blue pigments – Two blue pigments have been identified, and their bands often appear together in the spectrum (although with different intensities). These were ultramarine blue and Prussian blue. Ultramarine blue consists of an aluminosilicate matrix capable of trapping sulfur ions (S_2^- and S_3^-), which are responsible for the pigment's coloration. Prussian blue, on the other hand, is synthetic (from the early 18th century) and corresponds to iron hexacyanoferrate (III).

Yellow pigments – Zinc chromate and lead chromate were used in the canvas. Their spectra present clear differences. No goethite-characteristic bands were observed.

Green pigments – These pigments result from a mixture of blue and yellow, as can be seen in the micrograph presented above. In this case, yellow consists of chromates and blue by ultramarine blue or Prussian blue.

Orange pigments – The identified orange pigments were comprised either of pure basic lead chromate or basic lead chromate mixed with lead chromate and vermilion chromate. The Raman spectrum obtained from sample 12 clearly shows the bands of these three substances in the same spectrum.

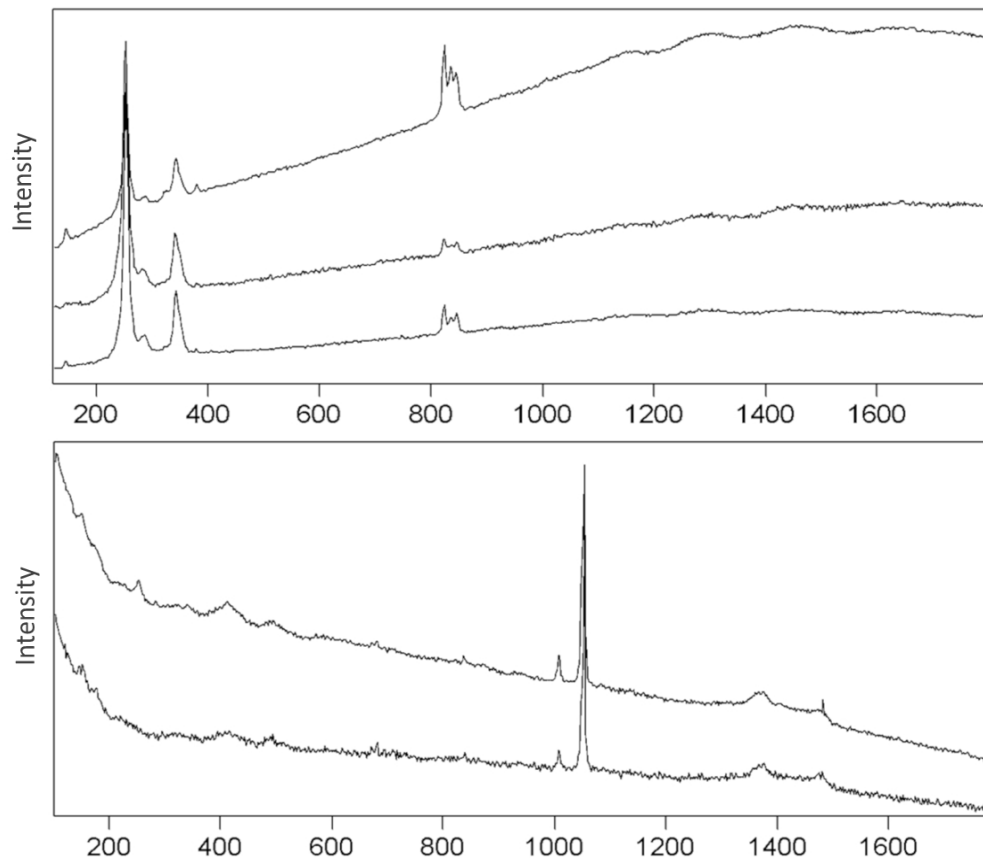


Figure 21 – Raman spectra of pigments collected from A. Modigliani's Self-Portrait. MAC/USP Collection.

Table 1 presents and summarizes the chemical elements and pigments found in the samples collected from the painting.

Table 1. Summary of chemical elements and pigments found by EDXRF measurements in samples of A. Modigliani's *Self-Portrait*, analyzed by Raman spectroscopy. MAC/USP Collection.

COLOR	ELEMENTS (EDXRF)	PIGMENTS (RAMAN)	C H E M I C A L COMPOSITION
White	Pb	White lead	$(\text{PbCO}_3)_2 \cdot \text{Pb}(\text{OH})_2$
White	-	Calcium sulfate dihydrate	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
Ocher	Fe	-	
Brown	Fe	Iron oxide and coal mixture	$\text{Fe}_2\text{O}_3 + \text{C}$
Red	Fe	Hematite	Fe_2O_3
Red	Hg	Vermilion	HgS
Black	Ca	Coal	C
Blue	-	Ultramarine blue	$\text{Na}_8[\text{Al}_6\text{Si}_6\text{O}_{24}]\text{Sn}$
Blue	-	Prussian blue	$\text{Fe}[\text{Fe}(\text{CN})_6]$
Yellow	Zn	Zinc yellow	ZnCrO_4
Yellow	Cr	Chrome yellow	PbCrO_4
Orange		Chrome orange	$\text{PbCrO}_4 \cdot \text{PbO}$
Mixtures	Cr	Yellow (Chrome Yellow or Zinc Yellow) Red (Chrome Red)	

FINAL CONSIDERATIONS

Technical-scientific analyzes, which use physical and chemical methodologies to investigate objects of art and cultural heritage are interesting to different fields. They contribute to an interdisciplinary approach to cultural objects, investigating their physical characteristics to shed light on artists' creative processes and on the material conditions under which they accomplished their works. These detailed studies also provide information on works' state of conservation, their techniques and the chronology of their use. In the case of easel paintings, these analyzes allow for the determination of existing materials' chemical composition, accurately describing the painting's palette of pigments. It also provides elements for the identification of the work's historical period.

Besides contributing to the larger research project on the artist's techniques, this study on one of Modigliani's works allowed for a clear determination of the artist's color palette, choice of canvas fabrics and preference for a certain canvas format. Regarding the study of colors, we were able to generate a table describing the pigments most often used by Modigliani. This poses new research questions: did Modigliani purchase his paints pre-made, directly from art supply stores? Everything points to a positive answer. What does this mean for the understanding of an artist who lived a very austere, almost resourceless life? His reuse of brush and pigments led to a series of works that strongly resemble each other, almost as if they are variations on a theme. If, on the one hand, one can analyze such a phenomenon as a result of his study of Cézanne's works, on the other, is it possible to imagine that he experimented with other colors and pigments? These and other questions open new analytical perspectives that go beyond the problem of the artist's technical procedure. Pursuing these questions may show that sociability networks made Modigliani's artistic production possible, or lead to the reevaluation of a painting (or of a painting problem) not only in its formal dimension, but also in terms of how much these formal aspects are impacted by an artist's actual technical and material means.

REFERENCES

BOOKS, ARTICLES AND THESES

BRAUN, Emily. “The Faces of Modigliani: Identity Politics Under Fascism”, in KLEIN, M. (org.). *Modigliani. Beyond the Myth*. Nova York: The Jewish Museum; Yale University Press, 2004, p. 24-41.

CAMESASCA, Ettore; BARDI, Pietro Maria (orgs.). *Trésors du Musée de São Paulo. De Manet à Picasso*. Milão: Mazzotta; Fondation Pierre Gianadda, 1988.

COHEN, Patricia. “A Modigliani? Who Says So?”. *The New York Times*, Feb. 2, 2014. Available at: <<https://nyti.ms/2GOrlSf>>. Access on: Aug. 1, 2019.

CONTENSOU, Bernadette; MARCHESSEAU, Daniel. (orgs.). *Amedeo Modigliani*. Paris: Musée d'Art Moderne de la Ville de Paris, 1981.

COQUIOT, Gustave. *Des peintres maudits*. Paris: André Delpeuch, 1924.

DAGLI ORI ANTICHI AGLI ANNI VENTI. “Le collezioni di Riccardo Gualino”. Turim, Palazzo Madama – Galleria Sabauda, dezembro de 1982 a março de 1983. Milão: Electa, 1982.

FRAQUELLI, Simonetta; IRESO, Nancy; KING, Annette. “The Modigliani Technical Research Study”. *The Burlington Magazine*, CLX, March–May, 2018, p. 181-195, 311-324, 394-399 e 400-407.

FRAQUELLI, Simonetta; IRESO, Nancy (orgs.). *Modigliani*. Londres: Tate Publishing, 2017.

GUALINO, Riccardo. *Frammenti di vita*. Turim: Aragno, 2007 (1a. edição, Milão, Mondadori, 1931).

LEWIS, Mary Tomkins. Paul Cézanne. *Painting People*. Londres: National Portrait Gallery Publications, 2017.

MAGALHÃES, Ana Gonçalves. *Classicismo, realismo, vanguarda: pintura italiana do entreguerras no acervo do MAC USP*. São Paulo: MAC USP/PRCEU, 2013.

MAGALHÃES, Ana Gonçalves. *Classicismo moderno. Margherita Sarfatti e a pintura italiana no acervo do MAC USP*. São Paulo: Alameda Editorial, 2016.

MARQUES, Luiz (ed.). *Catalogue of the Museu de Arte de São Paulo Assis Chateaubriand. Italian Art*. São Paulo: Prêmio Editorial, 1998.

MOSTRA DI MODIGLIANI – APRILE MAGGIO 1946. Milão: Associazione fra gli amatori e i cultori delle arti figurative contemporanee/S.A. Alfieri & Lacroix, 1946.

PATANI, Osvaldo. *Amedeo Modigliani. Catalogo generali dipinti*. Milão: Leonardo Editore, 1991.

PEDROSA, Mário. “Modigliani em triunfo”. *Jornal do Brasil*, May 29, 1958, 1o. caderno, p. 6.

POGREBIN, Robin; REYBURN, Scott. “With \$170.4 Million Sale at Auction, Modigliani Work Joins Rarefied Nine-Figure Club”. *The New York Times*, November 9, 2015. Available at: <<https://nyti.ms/2SRjhod>>. Access on: Aug. 1, 2019.

RESELLINI, Marc (org.). *Modigliani, l'ange au visage grave*. Paris: Skira, 2002.

RUSCONI, Paolo. “Lettere su Modigliani: Enzo Maiolino e l'archivio di Giovanni Scheiwiller” In: LECCI, L (org.). *Modigliani, dal vero: testimonianze inedite e rare raccolte e annotate da Enzo Maiolino*. Gênova: De Ferrari, 2016, p. 149-157.

RUSCONI, Paolo. “Omaggio a Modigliani di Giovanni Scheiwiller. Celebrazione e culto dell'artista di Livorno” In: LECCI, L; VALENTI, P (orgs.). *Studi di Storia dell'Arte in ricordo di Franco Sborgi*. Gênova: Genova University Press, 2018, p. 603-609.

RUSCONI, Paolo. “Sulla redazione dell'Amedeo Modigliani di Giovanni Scheiwiller e il suo contesto”. *Studi di Memofonte*, vol. 20/2018 [no prelo].

SARFATTI, Marguerita. *Espejo de la pintura actual*. Buenos Aires: Argos, 1947.

SOBY, James Thrall; BARR, Alfred (orgs.). *Twentieth Century Italian Art*. Nova York: MoMA, 1949.

SOBY, James Thrall. *Modigliani Paintings, Drawings, Sculptures* (April 10 to June 10, 1951). Nova York: The Museum of Modern Art, 1951.

VENTURI, Lionello. *La collezione Gualino*. Volume primo. Turim, Roma: Bestetti; Tumminelli, 1926a.

VENTURI, Lionello. *Il gusto dei primitivi*. Bolonha: Zanichelli, 1926b.

VENTURI, Lionello. “Mostra individuale di Amedeo Modigliani, sala 31”. In: Cat. exp. *Catalogo illustrato della XVII Esposizione Biennale di Venezia*. Venezia, 1930, p. 116-121.

Article presented on 09/16/2018. Approved on 02/08/2019.



All the contents of this journal, except where otherwise noted, is licensed under a Creative Commons Attribution License