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The apology for bloodletting in the portrait of an eighteenth-century Florentine surgeon

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Abstract

This paper analyzes the portrait of the 18th-century Florentine surgeon Vincenzo Bachini, kept at the Galileo Museum in Florence. The painting might date back to around 1760-1780 and depicts the Bachini hanging a lancet case in his right hand, alluding to his bloodletting skills. A technical study of the painting has been performed using the non-invasive imaging techniques, Near Infrared (NIR) photography and Vis-NIR hyperspectral imaging (HSI). The size of the lancet case appears as purposely exaggerated in order to draw the viewer's attention on the bloodletting instrumentations, as if to extol a medical practice on the wane, but still largely trusted. The portrait has been so far unpublished, and the present study is intended as an investigation on the role of bloodletting practice in the age of Enlightenment.

Keywords: Art and medicine - Bloodletting lancet - Vincenzo Bachini - Florence - Near-Infrared (NIR) photography - Hyperspectral imaging

1. Introduction and historical context

The aim of this study was to investigate the figure of a subject portrayed in a pictorial work donated to the former Institute and Museum of History of Science, now the Galileo Museum in Florence. Archival data relating to the provenance of the painting and the identification of the subject were very limited, and only the name of the donor and the identity of the subject were known, while the name of the portrayed man, Vincenzo Bachini, was not very significant.

There was no reference to the history of the painting or to the author.

Therefore, we proceeded with multiple lines of investigation. First, we tried to reconstruct the reasons that led the donor to leave the work to the Institute and Museum of History of Science through archival sources and literature.

Since there was no evidence of signatures, dates, or other identifying signs on visual inspection, a technical study of the painted surface based on advanced imaging techniques was also undertaken. Two noninvasive and complementary techniques, Near-Infrared (NIR) photography and Visible-Near Infrared (Vis-NIR) hyperspectral imaging, were applied to investigate the pictorial surface and its inner layers, seeking hidden elements or faded traits that could help in historical reconstruction.

The portrait of surgeon Vincenzo Bachini now in the Galileo Museum in Florence (Fig. 1) was donated to the Institute and Museum of Science History, the forerunner of the Galileo Museum, in 1935 by the surgeon's last descendant, Clotilde Galletti. Her donation also included portraits of Lorenzo Nannoni, a famous surgeon and Bachini's brother-in-law, and Vincenzo Guidi, notary and Napoleonic soldier[1]. The latter's actual name is uncertain, since a Vincenzo Guidi is documented among the notaries working in Florence in the early nineteenth century, but a Lorenzo Guidi received a St. Helen Medal for his service in the Napoleonic Army[2]. Either of them could be the father of Luisa Guidi, Clotilde Galletti's mother: archival research could not clarify the question.

2. Portrayed subject

Biographical information on Bachini is scarce. A student of Giuseppe Vespa[3], he enrolled in the Medical College of Florence on 31 October 1760[4]. In 1775 he worked with his father-in-law Angelo Nannoni on a case of internal haemorrhage at the convent of Santa Maria di Monticelli[5]. Bachini is documented at the Innocenti Hospital in 1765 as a substitute surgeon, in 1776 as inoculating the foundlings against smallpox[6]. Moreover, he worked as a surgeon at the Bonifacio Hospital (a hospital for terminal illnesses, skin illnesses and mental illnesses) from 1767 to 1786[7], at the Santa Maria Nuova Hospital from 1782 onwards[8,9,10].

3. The portrait

The oil painting on canvas (Fig. 1), with a gilded wooden frame, depicts a man sitting three-quarters on a red damask armchair.

The man rests his right hand, which is holding a dark container, on a shelf of light veined marble, edged with an owl's beak decoration. The man is elegantly dressed in a dark blue velvet suit and a pigeon wings wig with a pigtail.
On stylistic grounds, the portrait might date back to Bachini's youth, between 1760 and 1780. The simple layout, the warm colouring, the compact brushstrokes remind of some works by Pompeo Batoni, such as the portrait of Don José Moñino y Redondo, count of Floridablanca (ca 1776, Chicago, Art Institute)[11]. Moreover, the neutral background and the characterization of the sitter through objects can be compared to works by Anton Raphael Mengs, who stayed in Florence between 1770-71 and 1773-74[12]. The pose of the sitter holding a medical instrument in plain view resembles the one of fra'Giovanni dei Servi in his portrait by Zoffany (1773, Florence, Uffizi)[13]. Of course, the pedestrian technique of Bachini's portrait simplifies the aforementioned models.
Non-invasive tests on the painting highlight a stylistic discrepancy between the concise figure and the highly detailed medical instrument (Fig. 2).

Fig. 1. Anonymous, *Portrait of surgeon Vincenzo Bachini,* 18th century, Florence, Museo Galileo

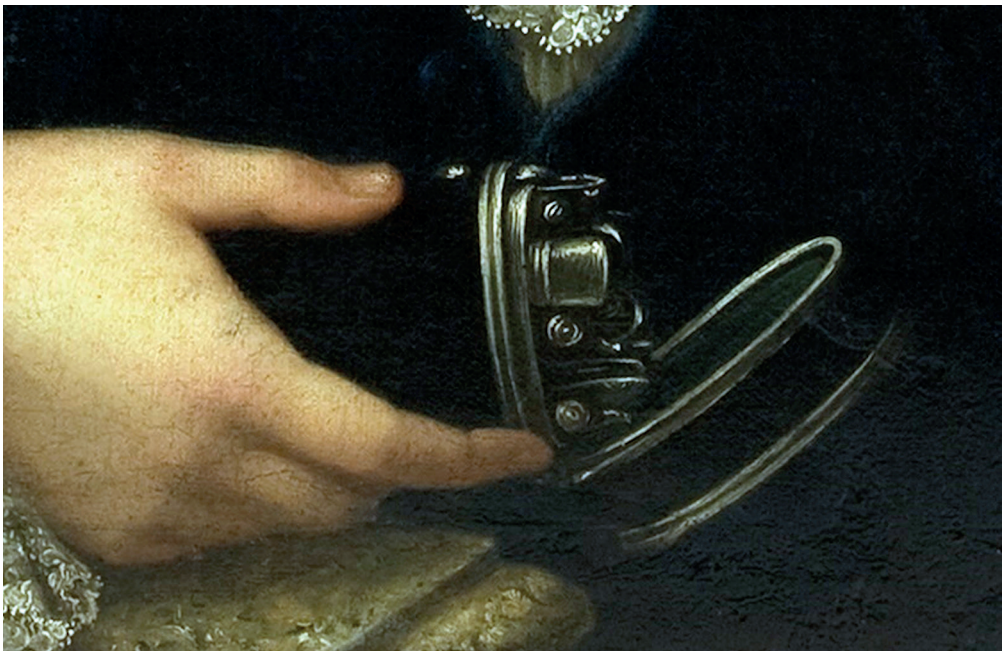

Fig. 2. Detail of Fig. 1 depicting a case with bloodletting lancets

4. Bachini's surgical activity

The portrait of Vincenzo Bachini is particularly interesting for the depiction of a case for bloodletting lancets.

Bloodletting, that is taking blood from a patient with therapeutic intent, was an old practice: both Hippocrates and Galen recommended it, according to the humoral concept of medicine[14]. The logic of bloodletting was based on the belief of the existence of four humours in the human body, namely blood, phlegm, black bile, and yellow bile, and that an imbalance of any of these could lead to disease. Therapy was aimed at restoring balance when blood was thought to be in excess. Various tools were used to remove blood from superficial veins, from simple syringes or lancets, spring lancets, cupping, leeches and, with the passing of time, multi-blade scarifiers (tools used to make incisions on the skin). The amount of blood removed depended on the condition of the patient, as well as the doctor's practice, and ranged from relatively small quantities to more than litres of blood. Bloodletting grew in popularity along the centuries and became the standard treatment for conditions and it was commonly used to treat fever[15].

Currently, therapeutic bloodletting is used in the treatment of some diseases, including polycythaemia (a myeloproliferative neoplasm), haemochromatosis (iron overload), and porphyria cutanea tarda (a skin disease)[16].

The most common devices for bloodletting were double-edged iron or steel blades, with a pointed end, which were placed between two covers (or shields), usually made

of horn or tortoise shell, and all joined at the base with a rivet (Fig. 3). The shape of the blade determined how easily it could penetrate the skin and vein. The lancets were stored in small flat cases (Fig. 4) of different materials with hinged tops and separate compartments for each lancet[17].

The size of the hand blade had variable measurements: the portable ones, which had to be contained in a case, could measure approximately cm 6x1.2x0.3.

In the portrait, Bachini's cylindrical case seems to be made of black shagreen (rough, granular surface leather); the metal part of the four rivets, corresponding to the joints, is recognisable. Shagreen is the abdominal leather of stingray, often in a green coloration, or in black and slightly coarse scales. The cover of the case is edged with metal, and it appears to be closed with a snap button.

The fact that Bachini is represented with a case containing a set of bloodletting blades is strongly indicative of his specialization and confirms his activity as a surgeon, expert in bloodletting, as documented in Nannoni's book.

Within a few decades, Pierre-Charles-Alexandre Louis (1787-1872) would have found evidence of the harmfulness of bloodletting. Louis was a meticulous clinician, and he had a large collection of case records: he selected 77 patients suffering from a well-characterized form of 'pneumonia' and following the course of the illness that had led to their death, he showed that 44% of bled patients subsequently died, compared to only 25% of patients who were not[18].

Louis's discovery had found the evidence to convince doctors to abandon bloodletting, but not everyone accepted his conclusions, which can be considered a milestone in the history of Evidence Based Medicine, and continued to use lancets, leeches or cupping[19].

Fig. 3. Bloodletting lancet, France, 19th century

Fig. 4. Shagreen lancet case, 17th or 18th century

5. Technical investigations and discussion

To gain deeper insights into the painting - the dating and attribution of which were uncertain – a technical study of the painted surface based on non-invasive imaging techniques was undertaken. The investigations aimed at exploring the inner pictorial layers under the visible surface to intercept any possible additional element, concealed or not readily appreciable today, such as preparatory drawings, retouches, traits or signatures, etc.. These data, if present, could help integrate fragmentary archival documentation and complement historical reconstruction. Given the specific task of the analysis and considering that the object is a minor artwork, it was decided to carry out a measurement campaign using portable, cost-effective, and quick devices capable of providing further insights into the painting while maintaining an acceptable cost-benefit ratio.

Two cutting-edge imaging techniques were selected, the Near Infrared (NIR) photography (operating in the 850-1000nm spectral range) and the Vis-NIR hyperspectral imaging (HSI) (operating in the 400-1000nm spectral range). These techniques were implemented in-situ, utilizing compact instrumentation, which is appropriate for addressing logistical constraints when artworks cannot be relocated from their venue.

In-depth investigation of the pictorial surface and underlying levels is achieved owing to the complementarity of these two approaches, which reveal information that cannot be inferred by visual inspection alone[20]. HSI is a sophisticated imaging technique that is well established for non-invasive investigations of the polychrome surfaces of artworks. It provides a dense stack of spectral images of the painted surface, which is repeatedly acquired at sequential spectral bands through an extended spectral region (typically the Vis-NIR interval)[21]. In this study, HSI was implemented using a portable camera and complemented with NIR photography.

While the HSI data provide information on the pictorial materials and their distributions on the surface, NIR photography permits the examination of layers beneath the surface using infrared radiation. NIR photography exploits the capability of infrared radiation to penetrate below the pictorial film and is implemented using modified digital photographic cameras. This methodology can be considered a simplified variant of Infrared Reflectography and has proven to be effective for preliminary examination of the layers underneath painted surfaces[22].

In the present study, the NIR images do not evidence a preparatory drawing and do not show the presence of preliminary sketches or *pentimenti* (Fig. 5). The barely detectable thin contours of the figure, including the details of the face and the hands, match those observed in the finished painting. Apart from a few imperfections - such as a small shadow on the nose or a small cut in the background canvas - the NIR images do not reveal any change with respect to the original setting of the composition. However, NIR photography reveals the presence of some degradation of the pictorial film at the lower area of the painting, where the right sleeve and the hand holding the instrument are depicted. In addition to the *craquelure*, small losses of color are noticed that are not visible in the final version (Fig. 5c, Fig. 5d), suggesting the presence of some retouching interventions. Apart from these alterations in the bottom portion, overall, the pictorial film appears intact, with no evidence of significant non-original parts.

The portrait features stylistic characteristics typical of the artistic period to which it is referred (second half of the eighteenth century), such as the posture, the highly refined details, the strong contrasts between lights and shadows, and a limited palette with a dark background and highlights on the elements to be enhanced, such as shining metallic blades, lancets and the edges of the elegant case. All these details, along with the absence of *pentimenti*, reveal an accurate if pedestrian painting technique. Nevertheless, upon closer observation, the slight disproportion between the figure and the case with medical instruments in the foreground cannot be overlooked. In particular, the dimensions of the medical instruments appear as exaggerated, suggesting an intentional artistic expedient to attract the observer's attention and underline the professional skills of the portrayed doctor. Therefore, a more in-depth analysis was focused on this detail. The HSI data acquired on this area in the 400-1000nm range were analyzed. Based on the analysis of reflectance spectra, the presence of the pigment Prussian blue was iden-

tified. The pigment is an artistic material which is chronologically consistent with the supposed period of execution, since it was created in the laboratory by Johann Jacob Diesbach in 1704[23]. The use of Prussian blue to depict the bluish details of the sleeve and clothing indirectly confirms the correctness of proposed dating for the painting.

Fig. 5. Images acquired with the NIR photography. The arrows indicate the imperfections which are no longer visible in the final version of the painting. a) NIR image b) Detail - NIR image. c) Detail of the Visible image d) Same details as c) in the NIR photography

Further elaborations on the HSI data, based on the statistical algorithm Minimum Noise Fraction (MNF)[24] in the 420-900nm range, confirmed the presence of alterations in the pictorial layers of the lower part of the painting, namely in the dark dress, in the table corner and in the hand's finger (Fig. 6). These anomalies in the pictorial film can also be observed on the lid of the case, suggesting the possibility of small non-original repainting in this part. However, in the elaborated image (Fig. 6b), the medical instruments and the case appear to be precisely defined and correspond to those appearing in the visible image, with no evidence of materials inhomogeneity or modifications. This would indicate that the case and the medical instruments had been intentionally depicted with enlarged dimensions, exactly as they appear in the finished painting. A dimensional assessment can be performed. Considering the canvas size (57 x 70.5cm without the frame) it can be inferred that the portrayed figure is just slightly reduced with respect to the real dimensions (with a scale of about 1:1.2 -1.5). The corresponding dimensions of the object in the man's hand can be assessed based on the portrait scale. Because the overall length of the case includes a part hidden by the hand, and the displayed part is approximately one-fifth of the painting width, a variable length between 12 and 15 cm can be attributed to the case held by the character's hand. These dimensions are definitely exceeding those of real cases for bloodletting lancets of the same period, that typically measured approximately 6 – 8 cm[25]. This observed disproportion conflicts with the high level of accuracy and realism of the painting, suggesting that the dimensional exaggeration of the medical tool was intentionally highlighted by the painter, in order to draw the viewer's attention on the bloodletting skills of the subject.

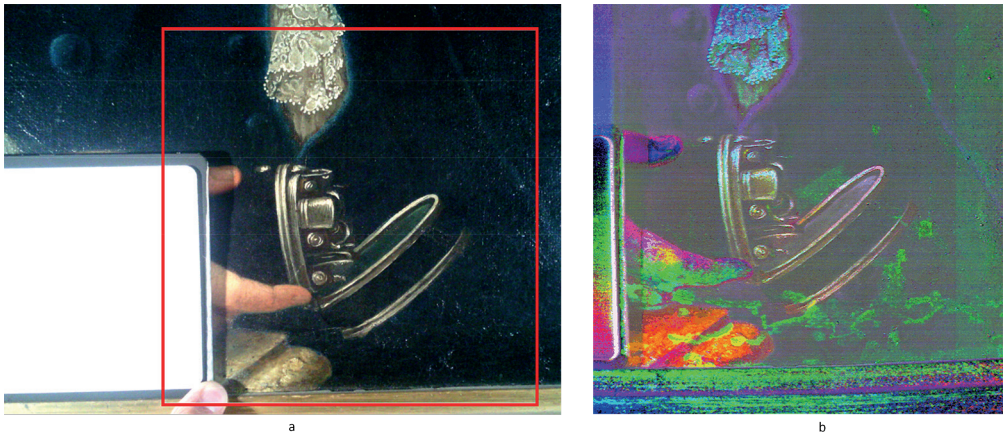

Fig. 6 a) The Vis image of the frame acquired with the HSI camera b) False color image obtained by the combination of MNF images (R=MNF6, G=MNF8; B=MNF9)

6. Conclusions

After examining the results obtained with the technical investigations and correlating them with the data taken from the biography of the portrayed character, it was possible to formulate an interpretative hypothesis, which explains the striking executive discrepancy. The subject of this painting is Vincenzo Bachini, who enrolled in surgery on 31 October 1760.

From the limited information available on his life and work, all deduced from indirect sources, we know that Bachini made great use of bloodletting, a practice inaugurated by classical medicine, which was very successful until modern times. The scarce occurrences in the documents link him to the practice of bloodletting, of which he was a staunch supporter in a historical moment in which, for the first time, its effectiveness began to be questioned.

The container of surgical instruments used for bloodletting appears larger than usual, as if the painter had wanted to give particular importance to the instruments, in an apology for bloodletting which even in those years was a practice in which a lot of trust was placed.

Only in 1800, thanks to the observations of Pierre Charles Alexander Louis (1787-1872), the effectiveness of bloodletting began to be seriously questioned through the provision of scientific evidence; nevertheless, it continued to be used on the basis of Hippocratic-Galenic teaching.

As is often the case in the history of medicine, figurative sources are crucial for supporting historical reconstruction[26]. In this study, Bachini's portrait was examined in depth as an additional historical source. It would be interesting to link the donor, Clotilde Galletti, to Giuseppe Galletti and explore the genealogical links, which would provide a more complete overview of Florentine obstetric surgery in the past. The biography of Vincenzo Bachini could also be studied further when other archival data were made available.

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