DETERMINATION OF FORGERY PAINTINGS IN THE WATERCOLOR TECHNIQUE - CASE STUDY

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Abstract
Taking into account the previously published material on the work with dubious paintings made with oil on canvas technique, the paper presents a way to determine the originality of an artistic painting made with the watercolor technique. Determining the authenticity of a work of art is a very complex process, especially with the watercolor technique, due to the small amount of paint, as well as the non-existence of the canvas in the base. In the absence of a certificate of authenticity or description in museum inventory or catalogs, art historians cannot determine the originality of a suspicious work of art without conducting a forensic analysis. For this purpose, forensic scientists and forensic experts use the following laboratory methods: X-rays that detect the presence of a sketch or image below the surface, spectroscopic analysis of materials by infrared rays (FT-IR, highlights changes in asymmetric vibrations of material molecules), stereomicroscopic analysis of painted surfaces luminescent source and/or polarizing additive), physical analysis of color layers by a directed beam of light directly or through different filters, analysis using ultraviolet (UV) rays, as well as analysis by Raman spectroscopy (IR spectroscopy that highlights vibrations that are symmetrical to the center of symmetry of molecules). The paper presents a real case study of the forgery of the artistic painting of the English sculptor Henry Moore, made using watercolor and graffiti techniques, from 1937.

Keywords: Art painting, Forensics, Laboratory analysis, forgery, aquarelle technique

1. INTRODUCTION

Have you ever wondered what makes art really original and unique? Is it the hand that made it or the innate qualities of the work itself? If a fake Van Gogh appears as beautifully vibrant as an authentic one, enough that not even an experienced eye can tell the difference, why does the art world revolve around the concept of authenticity to such a large extent? The fact is, every artwork is an unparalleled expression of individual creative talent and a result of a precise personal, historical and cultural context. Art forgeries, even if aesthetically pleasant or technically stunning, can cause serious misinterpretations with extremely damaging consequences, first of all in the academic field, as well as disruptions to the art market. It could easily seem that the main purpose behind art forgery would be financial gain – do not be misled, profit surely plays a huge part and a gigantic amount of money is involved – but it is often the case that the human factor has a considerable role, in some instances the
desire for revenge against a system that doesn’t seem to recognize the talent of a would-be artist [1].

2. COPIES AND COUNTERFEITS

Not all works that are not original are forgeries. It is completely legal to own or make a copy of a work of art if it is not presented or distributed as the original. Copies of works of art that are not forgeries are: Replica - another production of the original by the artist or his workshop, replication is a copy made of exceptional quality, usually by another artist and reproduction is a copy that is usually made with industrial techniques in very large series, and therefore, in its artistic quality, is much inferior to the original [2].

Among the varied categories of art forgers, we can distinguish two major groups, the ones who create replicas of existing artworks and those who create brand new pieces inspired by celebrated painters. To the latter surely belongs Wolfgang Beltracchi, who is considered “the forger of the century” in one of Germany’s greatest art scandals. Over more than thirty years, together with his wife, he hoaxed collectors, gallery owners, and museums.

The strategy was to “fill the gaps” in the artists’ bodies of work, either inventing new works or creating paintings that were believed to be lost but whose titles were known and no images existed that reproduced them. The couple’s scam came to an end in 2011 when experts discovered traces of titanium white in a supposedly 1914 painting by Heinrich Campendonk, but the pigment did not even exist at that time. One thing led to another and eventually the two were found guilty for forging 14 works of art (dozens of other suspected instances could not be proved) and sentenced to a few years in prison. Nowadays, Beltracchi uses his remarkable artistic talent to create original works that are exhibited in gallery shows [1].

Paper and canvas are the two favorite choices amongst forgers. Over the years, they have cracked the key to beat visual scrutiny, and sometimes even chemical analysis! Paper: To fake older artists and beat the carbon dating test, the forgers must find the paper that fits the era. They scavenge bookstores in search of old books. Since olden times, books have had one or two empty pages in the front or back. The forgers tear these papers and use them for drawing. Other forgers let the paper select the master. Whichever artist’s style fits the dimension of the paper gets used in that particular forgery [3].

3. METHODS FOR DETERMINATION OF COUNTERFEIT

Traditionally, art historians, archaeologists and restorers / conservators characterize cultural assets visually and with the help of optical microscopy. The modern approach implies close cooperation of experts in the field of art, social and natural sciences. The application of methods of physico-chemical analysis enables unambiguous identification of used materials, as well as their micro-chemical and micro-structural characterization. In order for the analytical technique to be applicable to this type of testing, it is important that it is fast and non-destructive. The available amount of material for analysis usually does not allow repeating the measurement. Samples are heterogeneous - complicated selection of a representative sample and establishment of correlation of results obtained by different techniques in independent trials.

It is common to use the following physico-chemical methods in the process of determining forgeries of artistic paintings:
- Infrared (IR) spectroscopy
- Micro-Raman spectroscopy
- X-ray fluorescence analysis (xRF) and
- Optical microscopy method with luminescent source.

Digital X-ray fluorescence method and Raman spectrometry are methods that are used in cases during forensics, they are the methods applied in the process of expertise of the image from practice.

Both methods are spectroscopic methods. Spectroscopy is a scientific field that studies the interactions between electromagnetic radiation (both visible light and other areas of the electromagnetic spectrum) and the examined sample. Spectroscopic methods are used to identify substances, as well as to determine their amount present in the test sample based on the spectrum obtained by emission, absorption, reflection or scattering of radiation, or for qualitative and quantitative analysis of substances. Spectra obtained by Raman as well as infrared spectroscopy represent a "fingerprint" for chemical compounds. To the human eye, some colors may appear identical, but based on the spectrum, differences in the chemical composition of pigments can be clearly seen and it can be unambiguously determined which pigment was used [2].

3.1. Case study

Forensic analysis was performed to determine the originality of the painting [4], which is assumed to be the work of the English artist Henry Moore, in the technique of watercolor, charcoal and ink, Figure 1.

Fig.1. Controversial painting made with the technique - watercolor, charcoal and ink
The "watercolor" technique rarely appears in forensic analyzes, mainly due to their incomparably lower price compared to paintings made with the oil on canvas technique. Thus, in the forensic analysis of oil paintings on canvas, there are numerous studies and examples, while each painting made with the watercolor technique represents a specificity and thus a challenge for forensic scientists [5].

In the specific problem, the image and the frame in which it was placed were first examined in great detail. The painting shows the painter's signature and the mark of the year in which the work was created. In Figure 1, the position of the signature is indicated by an arrow, while in Figure 2 it is shown enlarged. On the back of the picture, there is a strip of paper on which the author's name is the name of the work and the year in which it was created (typed), Figure 3 and 4.

![Image of the painting with annotations](image1.png)

Fig. 2. Author's signature and year of creation “Moore 37”

![Image of the back of the picture with annotation](image2.png)

Fig. 3. The back of the picture. The bar with visible inscription (arrow)

![Image of the visible text of the inscription](image3.png)

Fig. 4. Visible text of the inscription - H.Moore:
Ideas for Metal Sculpture 1937
In order to analyze the disputed painting in more depth, it was necessary to analyze the works of this English artist/sculptor from the period indicated in the controversial painting. On that occasion, data on the works of Henry Moore were collected from the catalog of the Henry Moore Foundation (HMF). The images with which the disputed image could be compared, because they were made with the same technique, are in Figures 5-9.

Fig.5. Group of Figures - made with gouache, water color, brush and shower

Fig.6. Drawing for Metal Sculpture - made with the technique of watercolor and chalk
Fig. 7. Drawing for Metal Sculpture - made by the technique of washing and showering, chalk, watercolor

Fig. 8. Drawing for Metal Sculpture - made using the technique of charcoal, pastel, watercolor, brush and shower, chalk

Fig. 9. Drawing for Stone Sculpture - made with the technique of pencil, watercolor, shower, chalk
The data obtained indicate that in the period from 1930-1939, this artist mainly used the technique: charcoal, watercolor (watercolor), ink, pencil and chalk. The focus of material testing was mainly on these materials.

As it can be determined, the disputed painting is in the catalog and belongs to the artist's work, and according to the nuances of the colors used, Figure 7 (which is in the catalog of the Henry Moore Foundation under number 1313) was chosen as the painting with which it will be compared. The selected image, both in terms of work techniques and visually, best suits the disputed image.

3.2. Physico-chemical analysis

For the needs of the physico-chemical analysis, the following methods were used [6, 7]:

1. Optical microscopy method with a luminescent source, performed on a microscope of the brand "Kern" type "Oko-Okn 178";
2. Digital X-ray fluorescence method, made on a Shimadzu instrument type "Sonialvision";
3. Raman spectrometry method, performed on an instrument of the brand "Rigaku" type "Progeny ResQ".

The method of optical microscopy with a luminescent source and a polarizing additive, under several different magnifications, was used as the first elimination method. This method observes the similarities of selected parts of the artist's controversial and undisputed paintings. Selected places in individual images are marked and shown in Figure 10.

Fig.10 Comparison of image no. 7 (A) and disputed image (B)

After the analysis by optical microscopy, similarities in the shades of the used colors and techniques were noticed, but minor discrepancies were also visible, so further laboratory analyzes were started.

The X-ray fluorescence method was applied only to the disputed painting, to determine whether there was an earlier painting below the original (which is often the case with forging works of art), but also to see traces of a graphite pencil often used in watercolors. Due to the geometry of the image, X-ray fluorescence of the left and right sides was done separately. The results are shown in Figures 11 and 12.
As the X-rays shown above do not show the expected details (micro-traces of previous sketches with pencil or ink, graphite or other paint), the originality of the image began to be justifiably doubted, and further laboratory tests were started. The method chosen is the Raman spectroscopy method as a very sophisticated method.

By applying the method of comparative Raman spectrometry of marked places (Figure 10), a series of spectra was obtained, of which only some characteristic ones were singled out. They are shown in Figure 13.

Fig. 13 Comparative spectra of undisputed (a) and disputed images (b) Henry Moore
The analysis of the obtained spectrograms, indisputable and disputable images reveals the difference in the position and intensity of the peaks of the wave numbers of the examined and comparative samples. This result indisputably indicates that the disputed painting is not the work of the English artist Henry Moore.

3. CONCLUDING REMARKS

In the modern world, the desire for easy money is more and more pronounced, especially in the world of art, where the number of falsified works has increased with the improvement of technology. The falsification of paintings with the oil on canvas technique has developed greatly and the number of techniques used in the production of forgeries is on the rise, as is the speed of production. At the same time, although on a smaller scale, there is also the falsification of art paintings made with the watercolor technique. Proving that this work is a forgery is possible only by non-inverse examination techniques such as X-ray fluorescence and Raman spectroscopy.

By the example presented in the paper, the authors hope to enable the colleagues who work in the same or a similar field to successfully shorten the process of forensic analysis and speed up the process of finding the perpetrators of this crime, as well as to prevent the crime environment in order to reduce the number of these acts.

4. REFERENCES

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