#PrideUTN: Patricia Silvana Carrizo, pioneer in Archaeometallurgy in the Argentine West

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Inanimate objects encode messages over time, which can then be interpreted through scientific and technological analysis. And they shed vestiges of other times and portray distant everyday life.

An example of this are the metallographic studies that Eng. Patricia Silvana Carrizo has made nails and funeral tacks of the Ruins of the San Francisco Church, as well as the structure of the Iron Bridge over the Mendoza River. And she is currently analyzing the pictorial works that are hidden behind the plasterboards in the Casa de Fader Emiliano Guiñazú museum.

All this is part of a specialty that was incorporated into the FRM Metallurgy Laboratory, called Archaeometallurgy.

She receives UTN FRM Press in the Laboratory and - with an affability and sympathy to highlight - she presents us with equipment, photographs of metallic structures taken with a microscope (worthy of framing and exhibiting), samples that her students analyze. And she tells us part of her experiences:

Image: Engineer Patricia Carrizo meassuring oil wall unknown paintings in the Fader's Musseum (Luján de Cuyo, Mendoza, Argentina)

Secrets behind the wall

Through a rig in the shape of a barcode reader, although much more voluminous, the engineer has carried out in situ analyzes of the pigments of the paintings found in the Fader museum.

It is an x-ray fluorescence spectrophotometer (of German origin), non-invasive, non-destructive testing method, portable and extremely shallow reading (20 microns!).

The “little device” is transported to the museum by the engineer and some collaborators such as Ing. Cristian Aguilera and fellow students. They study strokes, colors, wavelengths, pigments, etc., in order to certify the origin of the works of art found behind the wall.

Archaeometallurgy allows us to reach conclusions, we would say, sociological; as for example that those hidden paintings would correspond to the years of youth of Fader.

Silvana notes: "they are supposed to be the first paintings that Fader made, as soon as he arrived from Germany where he studied and that perhaps they did not comply with the canons of what it meant to be a painter and that is why they were hidden."

White and radiant

Going to objective data, he explains: “for each painting found, six measurements were made for each area of each color: green, red and blue, which are the most common. But Fader used white a lot, both lead and titanium, and this last one assures us that restoration works took place "

A super spectrophotometer

It is noteworthy that the methodology applied to carry out the study represents an innovation, the engineer investigated about the state of the art regarding the studies of pictorial works and modified the technique adapting it to the Fader Museum. She also found that the spectrometer he uses is of superior technology than those used in other investigations and that it reads a greater number of chemical elements, that is, wavelengths of elements, each of which corresponds to a color.

Lead, a silver-colored heavy metal with a bluish hue, which tarnishes to a matte gray color, and titanium, a transition metal, silver-gray.

Another important fact is that Fader worked with Winsor & Newton brand paints, "this would allow us to compare with the color catalogs as a final contrast."

In total there are about twelve works that, in addition to the inquiries already described, are contrasted with the walls of the museum and until now there is a repetition of lead white and titanium white, which in Fader's technique was inevitable.

Image: Showing to UTN Press the XRF device that Engineer Carrizo found useful to analyse art Works.

Analysis of the Old Iron Bridge - Luján de Cuyo

During this year, the Municipality of Luján de Cuyo commissioned the engineer to carry out the archeometallurgical study of the Old Iron Bridge (1890) over the Mendoza river in Luján de Cuyo, one of the first three bridges to be installed in the country provinces, brought from England and whose construction began in 1889, according to data from the Municipal Archive.

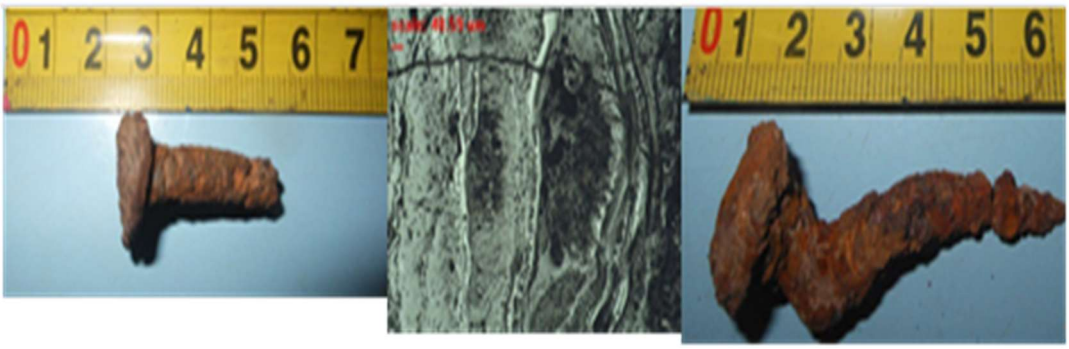
Approximately 20 years ago it had been maintained, cleaning the rollers and the rest of the bridge by hydro-washing. Then it was painted, not with epoxy but with another type of paint, lights, height and maximum permitted load markings were installed and the trail was widened.

“It was a work carried out by the Luján Commune and the Provincial Government at that time, without the intervention of the University, therefore, I estimate, the work that we were commissioned to do, it would be the first in terms of linking the UTN FRM with the Commune and the people from this city”

In conclusion, “the structure of the Bridge shows external corrosive deterioration, it needs sandblasting, a corrosion painting treatment, do an schema of paintings, and only then can we think of the final decorative painting. It needs lights again and it needs to be declared and cared for as what it is: a patrimonial and historical asset, also the bridge needs reparations of damage parts so we will replace parts with similar metal material to avoid any corrosion issues”

Among the dead, do metals shine?

The third of the works that -ad honorem- faced Ing. Carrizo is the analysis of four funerary nails and a tack found in a context of archaeological rescue in the Ruins of the San Francisco Church (City of Mendoza)



Images: Funerary nails and metallographic images from the San Francisco Church Ruins (Mendoza Foundation Area).

The pieces were subjected to longitudinal and transverse cuts, treated with reagents and photomicrographed. The hardness of each specimen was determined: the tack corresponds to a silicoaluminate brass, hot forged and presents corrosive attack by dezincification.

In some of the pieces it was possible to observe a grain of heterogeneous size, cracks from a corrosive process and a composition of steel with a spongy structure, typical of iron worked manually with the “puddling” technique.

The Jesuits would have made them in ovens in the shape of an inverted pyramid covered with natural refractory stone, a replica of the Catalan Forges, which would date from the 1800s.

Other of the pieces would be less old due to the detail of the manufacturing process, by means of sheet metal rolling and then shear cutting.

=> Engineer Carrizo explains:

“The presence of structures such as ferrite and pearlite was found, as well as dendrite structures, which are inclusions that have various chemical elements, many of which were inserted in the form of inclusions and therefore wasted in the sense that it was not known in that moment that certain combinations of alloying agents improve the characteristics of the steels in this case. Thus, a Carbon content of approximately 0.05% was achieved. "

"Among the dead, do metals shine?" is the name of Marcos Quiroga's thesis (for the Bachelor of History at the Faculty of Philosophy and Letters of UnCuyo) for which the work described above was carried out.

The Metallurgy Laboratory of the FRM has a portable spectrometer for the analysis of non-ferrous materials based on X-ray Diffraction, brand SPECTRO XSORT Handheld X - Ray Spectrometer. Both the pieces found in the San Francisco Ruins and the paintings in the Fader Museum have been analyzed with this device.

Image: XRF Portable Spechtrometer.

Restless student, curious graduate

Patricia Silvana Carrizo, Chemical Engineer, is a restless and curious professional, and these characteristics led her, even a student, to run into opportunities to develop empirically.

She already had a valuable asset as a listener and fellow at the University of La Sapienza, Rome - Italy (2007) and in an Archeometallurgy research group at the University of Buenos Aires, CABA (2009).

Today she is a pioneer in the western part of the country in the development of Archaeometallurgy and has also added it as a topic of scientific dissemination, while she serves as Head of Practical Works in the fifth year chair: "Materials Science" in the Chemical Department from UTN FRM.

It has publications on this subject at an international level, in both print and digital formats, in the Journal of the Research Institute of the Faculty of Geological, Mining, Metallurgical and Geographical Engineering (RIIGEO) of the Universidad Nacional Mayor de San Marcos in Peru.

Image: Engineer Carrizo working with the metallographic microscope.

And in the area of Cavitation-New Alloys and two other international publications in digital form for the Latin American Journal of Materials and Metallurgy belonging to the Bolivarian University of Venezuela.

School heritage conservation project

The study carried out by the engineer Carrizo, analyzing a dozen paintings found behind the wall in the Fader Museum, is part of the PID ECUTIME Project: 2076TC SCHOOL HERITAGE: COMPREHENSIVE EVALUATION OF VULNERABILITY, DURABILITY AND SUSTAINABILITY IN A HIGH SEISMIC RISK AREA by CEREDETEC for the Emiliano Guiñazú Musseum Fader's House.

Images: Colleague Eng. Aguilera measuring chemical composition with the Portable XRF on the walls of the Fader Museum and the Curator indicating better places to do measurings.

Archaeometallurgy, when metals speak

Archaeometallurgy is the field of research with metallographic techniques, through which information can be obtained about life in past times, that is, how people produced and used metals and alloys. It involves the study of a wide range of objects related to metals that have survived the passage of time and have come down to us in the present.

These metallic objects, the results of the original metal production processes and metallurgy, reached their present states after being subjected to one or more of many processes, including trade, use, modification, disposal and possibly some degradation in soil and / or alteration in museums or private collections.

Images: Funerary nails and metallographic images from the San Francisco Church Ruins (Mendoza Foundation Area).

They have been recovered from a variety of archaeological contexts, such as habitation sites, industrial facilities, funerary contexts (burials), hordes, and ceremonial sites (including offerings, river deposits, or other sacred sites).

It is useful to think that each of the objects that come to us from the past must have a story to tell, a story that, if read and interpreted, can contribute to our general understanding and even some of this information can be rescued to be applied to the development of new materials.

In addition, it can be transferred to society, since these studies are applied to museum pieces, for example, and provide great information that then museum managers and personnel who work in historical sites can use to explain more fully and even proudly to know a little more about the exponents that they exhibit at guided tours of: primary and secondary schools, tourist contingents, private tourists, and even organize lectures for scientific dissemination.

Source: FRM UTN Press