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Which ink? Which paper? Where is it?

FADAM, the Argentine Museums Friends Associations Federation, has held a Paper Conservation Laboratory, since 1994. The Laboratory, created to provide a solution for the progressive deterioration of paper based collections, was the first of its type in Argentina. FADAM caters for all kinds of works of art on paper and documents from museums, archives and collections all over Argentina.

WHICH INK?

The first step to treat a document or work of art is the accurate identification of substrate and inks before deciding what to do or even what not to do. Iron-gall inks are present in manuscripts and drawings; and in some cases in a crucial element: a signature on a Diploma, the artist's signature on a watercolour or gouache. The need to solve these cases and the complex nature of inks led us to the decision to study iron-gall ink composition (Daniels, 2001), its process of deterioration and the current treatments proposed by conservators and researchers.

The basis for this investigation was the information available from other colleagues and scientists who have been working on ink corrosion phenomena, and the information received during the course "The History and Treatment of Works in Iron Gall Ink", October 2008, at the Institute of Brazilian Studies, University of Sao Paulo, in Sao Paulo, Brazil organized thanks to financial support provided by the Getty Foundation. Conservators from 11 countries from South America and the Caribbean attended this training given by Dr. Han Neevel, conservation scientist and Birgit Reissland, conservator from the ICN in Amsterdam and with lectures and assistance by Valeria Orlandini, conservator from the Library of Congress, USA.

Solutions proposed such as the calcium phytate treatment seems to provide a chemical stability to documents containing iron gall inks (Neevel, 2001).

But which ink are we speaking about? In the Sao Paulo course, B. Reissland and H. Neevel mentioned the existence of hundreds of recipes due to translation misunderstandings, multiple ingredients combinations, diverse provenance of ingredients, and varying ingredients quality. Which ingredients and formulae were used to manufacture iron gall ink in our country?

WHICH PAPER?

Substrates have a crucial importance in Argentina's heritage, as most historical manuscripts, printed documents and works of art were created in the nineteenth or twentieth centuries, when industrial paper production started and wood pulp appeared as a new source of raw material (Van der Reyden, D, 1995). We speak of "Modern papers" (Gear et al. 2007) when referring to machine made papers manufactured since 1850 to our days.

A folder holding manuscripts from the nineteenth century was analysed as a case study. These documents were written by Dr. Juan Antonio Argerich, a remarkable professional in Argentine Medicine History. He had a crucial participation during the Yellow Fever Epidemy (Typhus amaril). This Epidemy caused thousands of deaths in Buenos Aires in 1870.

The examination of this object included paper identification (watermark: Original Turkey Mill, Kent, microscopical fiber analysis: raw material identified as mechanical wood pulp), classification of ink condition, using the Condition rating system proposed by Birgit Reissland, visual examination, photographic documentation using different light sources and application of non-bleeding test for iron (II) ions, developed by Netherlands Institute for Cultural Heritage. According to Reissland's condition rating , these papers presented a *fair* condition, so it was decided no treatment was necessary; just appropriate storage made from archival quality materials (Reissland 2001).

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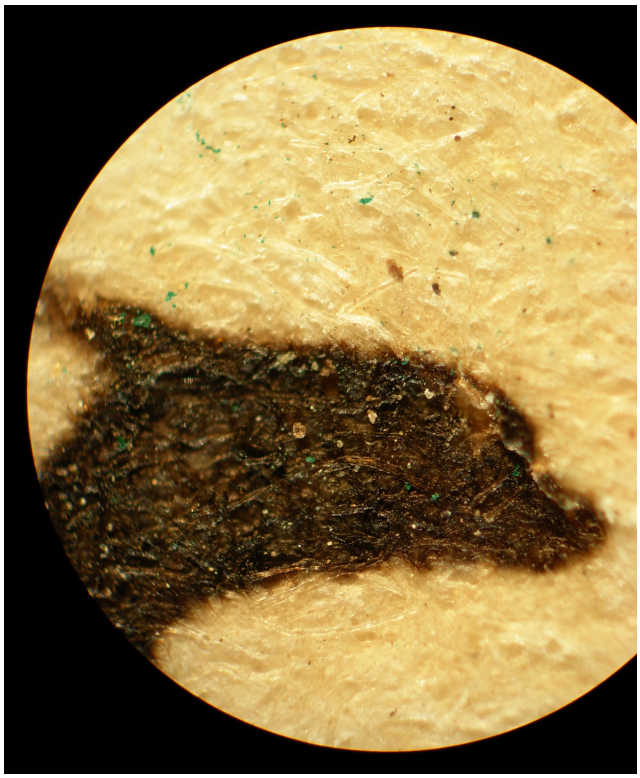

Fig. 1. Detail from Argerich manuscript, where solid particles can be observed on the ink surface. Magnification 40x

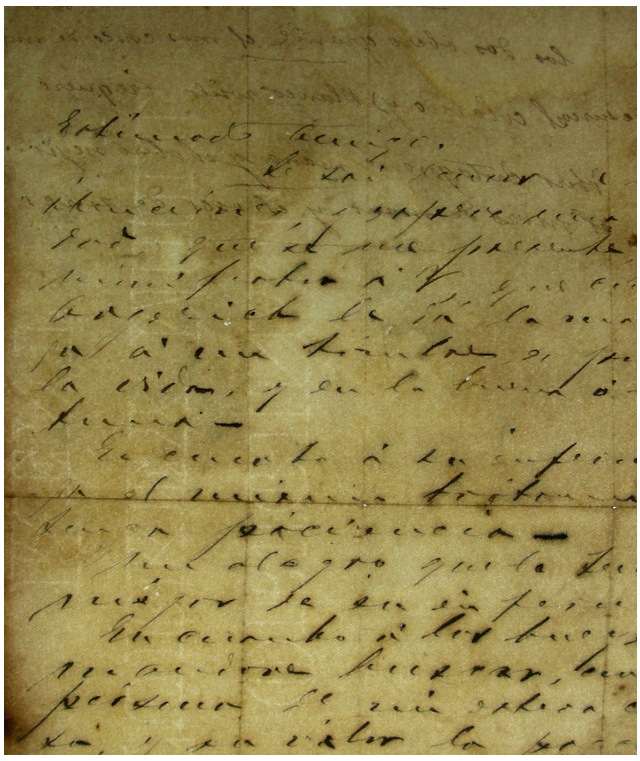

Fig. 2. Detail of Argerich manuscript—transmitted light showing watermark

WHERE IS IT?

Should we put into practice treatment options when most paper collections in Argentina lack of appropriate environmental conditions? There is still a lot to be done to raise awareness on the need of better environmental conditions for collections exposed to violent RH and Temperature fluctuations, dust and environmental pollution and/or inadequate storage. Given the fact that documents holding Iron Gall inks should be stored at 50% Relative Humidity + 5% and 18° C + 2, is such an ideal environment possible?

CASE STUDY: MANAGING AVAILABLE RESOURCES

A project called *FADAM in MEGA, Plan de Recuperación Documental del Museo de la Emigración Gallega en la Argentina* (Documents Recovery Plan in the Museum of the Galicia Emigrants in Argentina) became an opportunity to disseminate information on preventive conservation solutions for documents containing Iron Gall inks. The project, organized as a hands-on training experience for Conservation students from UMSA (Universidad del Museo Social Argentino), involved condition assessment for a group of 5000 historical documents: printed registration forms completed with ink. Procedures: substrates identification, inks identification, condition assessment, surface cleaning, design of enclosures for each document and storage boxes.

There was a special interest to complete this research showing a variety of possibilities for appropriate document storage, adapting inexpensive alternatives to substitute costly conservation materials. The idea was to design a working protocol, including processes and tested materials so that the museum can continue with similar documents, following the settled guidelines.

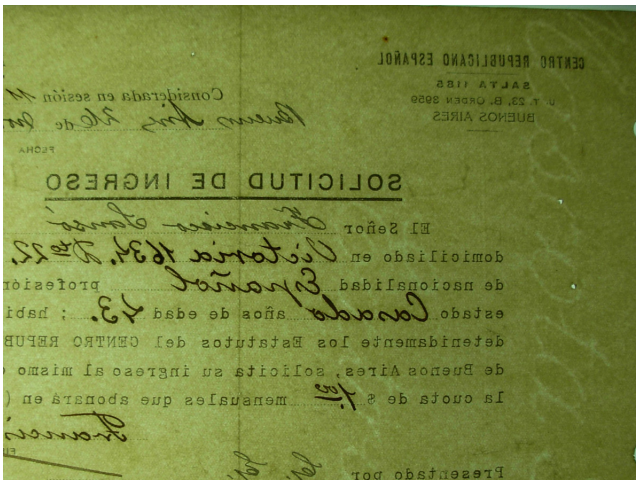

Fig. 3. Document from MEGA—transmitted light used to observe paper morphology, watermark and ink penetration

Qualitative fiber identification	Lignin	Grammage gr/ m2	Surface pH	pH		Starch (0 a 5)		Colour solubility	
				C	H	C	H	C	H
1. Kozo, long fibers	no	6 gr.	6,13	6,24	6,69	0	0	No	No
2. Chemically bleached long and short fibers	no	60 gr.	5,3	6,6	7,2	0	0	No	No
3. Chemically bleached long fibers and semi chemically treated short fibers	yes	180 gr.	7,63	9,05	8,95	0	0	No	No

Table 1. C: cold extract H: hot extract

MODERN PAPERS: LOOKING FOR ALTERNATIVES

The wide variety of modern papers, their inherent heterogenous nature and our need to confirm quality and technical data provided by suppliers, led us to design a methodology for paper diagnosis (Gear et al. 2007). The main objective was to test papers which might be eligible for storage and treatment, by means of accessible tests that could be done in our Laboratory. To achieve this, we received specific training on fiber identification and paper analysis by Engineer Olga Casal, an expert on paper identification and paper quality testing.

Twenty-five samples of paper, cardboard and boards offered by local suppliers for conservation treatment and mounting were analyzed systematically through the following tests:

- Microscopic analysis: Qualitative fiber identification (TAPPI 401 om-82)
- Grammage (weight per square meter)
- pH Measurement (Cold water extract) TAPPI 509 om-88
- pH Measurement (Hot water extract). TAPPI 435 om-85
+ Surface pH measurement TAPPI 529 om-88
+ Lignin content
- Starch content

(-) Destructive analysis
(+) Non destructive analysis, but requires the application of a water drop on the paper

A paper used for conservation should contain chemically bleached paste and no unbleached mechanical paste, and a neutral or alkaline pH depending on its use (Novaresi, M. 2007, ISO 9706, 1994; ISO 11108, 1996).

Table 1 shows results obtained from three papers, amongst the 25 mentioned:

1. Japanese paper (Japan)
2. Medical Grade paper (Argentina)
3. Blotting paper (Argentina)

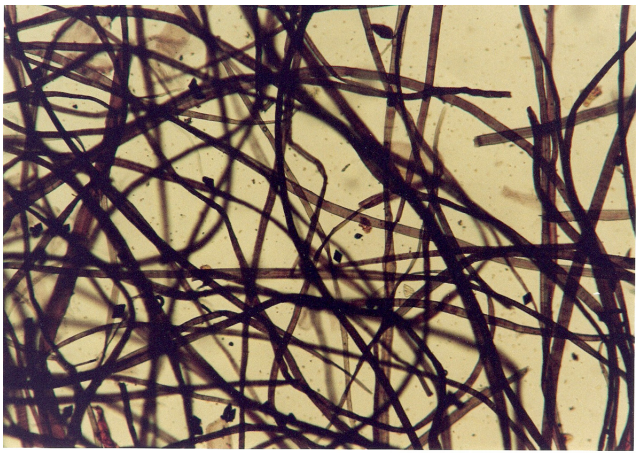

Fig. 4. Kozo paper fibers, optical microscopy (40x)

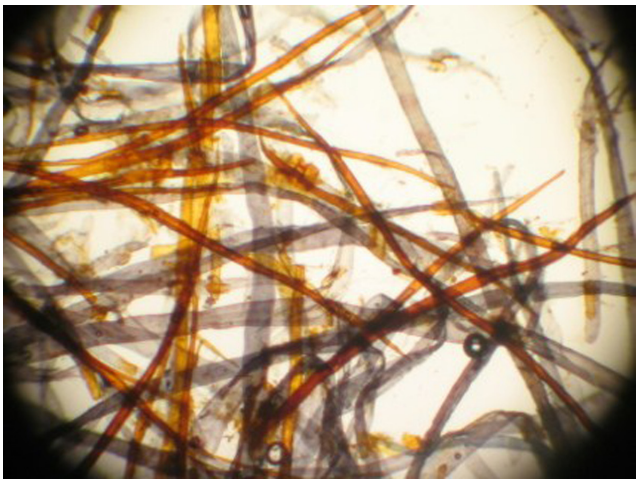

Fig. 5. Blotting paper fibers, optical microscopy (40x)

Conclusions: Paper 1 proved to be adequate for conservation treatments. Paper 2 proved to be adequate for document interleaving. Paper 3 (blotting paper) had low quality due to high lignin content; we replaced it with 100% cotton blotting paper.

Thanks to this project, we could identify papers available in our region, which were not created for conservation purposes but meet conservation standards.

To complete the materials selection for the FADAM in MEGA Project, we chose Medical Grade paper (paper 2) for document interleaving, and a 90 grams pale yellow paper, previously tested, to design folders for each document. Storage was completed with polypropylene boxes, size and design adapted to the documents dimensions. Museum authorities took the compromise to monitor environmental conditions within the building to optimize storage quality.

CONCLUSIONS

- Our approach towards documents containing Iron Gall inks takes into account paper, inks and environment. Stabilization treatment will be useless for a document if the environment in which it is stored in the future is not adequate and stable (Reissland, 2001).
- Using treatments developed abroad without proper identification of the items treated (paper composition and quality, inks composition), may give place to undesirable results (Kraan, M, et al, 2007).
- We need to learn about local ink manufacturers and suppliers in Argentina. The creation of reference ink samples would be useful together with non destructive methods such as Fibre-Optics Reflectance Spectrophotometry (FORS), an interesting tool that provides spectral reflectance curves and help identify elementary composition of inks (Neevel, H. et al, 2008).

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