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Discoveries and oddities in library materials

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ABSTRACT

Surprising discoveries can happen while analyzing library materials.
This paper presents four case studies focusing on four artifacts of different ages and provenances, all analyzed and studied at the Istituto Centrale per il Restauro e la Conservazione del Patrimonio Archivistico e Librario (Icrcpal). The common denominator amongst the case studies presented in this work, lies in the need for a strong interconnection between the analysis of biological issues and chemical data. The interplay between the two complementary approaches is paramount for the correct interpretation of the status of the material under examination as, as will be shown in the following case studies, chemical data could find an interpretation only in the face of biological observations and vice versa.
The first case we here present, deals with two parchment codices that have been found in 2008 during a fishing expedition in the Canale di Sicilia. At that time a deep-sea fishing boat belonging to the fleet of Mazara del Vallo caught in its nets, two artifacts, leading to the first discovery of library materials in the deep sea. The Scanning Electron Microscopy and Energy Dispersive Spectroscopy (SEM/EDS) analyses allowed for the creation of a compositional map of the surface of the samples, where several microscopic encrusting sea organisms and biogenic materials were also observed. Almost nothing of the original structure of the parchment (of which the object is presumably made) could be recognized at SEM. The absence of the typical collagen features was confirmed by Raman analyses that could only collect spectra of an isoprenic-type polymer of putative biogenic origin.
The second case deals with fragments of medieval manuscripts that were found in 2007 buried in the walls of the Great Mosque of Sana'a in Yemen. An outstanding discovery regarded the dark brown inks used on a Qur'ānic fragment attributed to the 10th century. SEM micrographs disclosed the presence of red blood cells mixed to ink components. The inks were also investigated with Raman spectroscopy.
The third case study is the book "*Libretto di appunti e memorie del Padre Francesco Zazzera*", dated 17th century that presented a peculiar modification of the black ink that appeared to be faded and turned to a white-yellowish color. Raman and SEM analyses recognized and documented a biogenic formation of jarosite on top of the ink. It was possible to remove the jarosite layer and to recover the original black ink, thus allowing an easier reading of the text.
The fourth and last case analyzed and presented in this paper consists of the measurements on the invaluable *Codex Purpureus Rossanensis* dated 6th century. Raman spectroscopy here allowed the demonstration of the use of an elderberry lake to obtain a mauve color. This is the first experimental evidence of the use of that particular dye in such an ancient illuminated manuscript.
A sort of archeological discovery was also done on this codex with respect to the past misfortunes that occurred to it; by simply observing some traces we were able to support some intriguing hypothesis on its history and vicissitudes.

1. Introduction

The backstage of book or archival document analysis might focus, in the general imagination, on collecting information on the supporting paper or parchment and on the inks, black, white or color used to decorate or write on the support. This is often not the case and, as a matter of fact, the reality of library material analysis often is very different and more articulated and can lead to the occurrence of surprising discoveries.

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This paper presents four case studies focusing on four artifacts of different ages and provenances, all analyzed and studied at the Istituto Centrale per il Restauro e la Conservazione del Patrimonio Archivistico e Librario (Icrcpal).

The first case deals with two parchment codices that have been found in 2008 during a fishing expedition in the Canale di Sicilia, 60 miles off the coast of Pantelleria (Sicily, Italy). The codices were given at first to the Soprintendenza per i Beni Culturali e Ambientali di Trapani. They have then been handled to the Biblioteca Centrale della Regione Siciliana, where they were left drying without any preliminary washing, while being stored in a suitable box. They were then sent to Icrcpal, for a complete characterization. One codex consists of the remains of about 30 deteriorated parchment sheets (cm 22 × cm 25), with only a few pages still in *bifolio* (Fig. 1, left). No writing signs or sewing traces are observable to the naked eye under the layer of salt that had covered all the sheets of the volume. The other consists of 40 not assembled parchment sheets (cm 54 × cm 30) and of a particular oversize parchment (cm 320 × cm 54) folded in 6 parts (Fig. 1, right). Also in this case, no graphic signs are observable to the naked eye.

The second case deals with one medieval manuscript fragment (Fig. 2) that was found in 2007 buried in the walls of the Great Mosque of Sana'a in Yemen, during restoration works. At that time around 4000 fragments in paper and parchment, dated 7th century–10th century, were found lying hidden in two niches on the western Mosque side, in correspondence to the minaret's wall. The fragments were in very poor condition and a conservation project was established between the Yemeni Antiquities Authority and the Icrcpal, where some samples were analyzed by using non-destructive techniques.

The third case study is the booklet "*Libretto di appunti e memorie del Padre Francesco Zazzera*", dated 17th century. Francesco Zazzera was a close follower and coworker of St. Filippo Neri, who founded in 1575 a society of secular clergy, called the *Congregazione dell'Oratorio*. He left numerous writings on the life and the doctrine of the Saint and a booklet containing notes and anecdotes. Such a booklet, consisting of around 40 pages, measures cm 9.3 × cm 13.9 and presented a peculiar modification of the black ink that appeared to be faded and turned to a white-yellowish color (Fig. 3).

The fourth and last case presented in this paper is related with the analyses performed on the invaluable Purple Codex Rossanensis (Fig. 4). The *Codex Rossanensis* is a 6th century Byzantine illuminated manuscript written on purple parchment and conserved at the Museo Diocesano in Rossano Calabro (Cosenza, Italy).

Fig. 2. The medieval Yemenite fragment (*recto* and *verso*).

The manuscript contains thirteen miniatures hinged on the Life of Christ, one miniature of the four Evangelists, part of the letter to Carpianum arranged in a golden decoration, the illumination of the Apostle Mark inspired by the Sophia; the codex is written in silver and gold on purple parchment with the occasional presence of black inks. In 1917–19 it was restored by Nestore Leoni, a famous miniaturist, whose intervention unfortunately irreversibly modified the aspect of the illuminated pages. Nestore Leoni never documented which materials he used for the restoration.

The chemistry laboratory was faced with several questions, namely on the nature of the products applied by Leoni during the restoration, the composition of the pictorial palette used by the miniaturist(s) and the composition of the different inks present in the manuscript. The laboratory also had to provide scientific information that could help in solving a problem of a paramount historical importance: some scholars supposed that the illumination of Mark inspired by the Sophia did not belong to the original manuscript, but had to be dated back to the

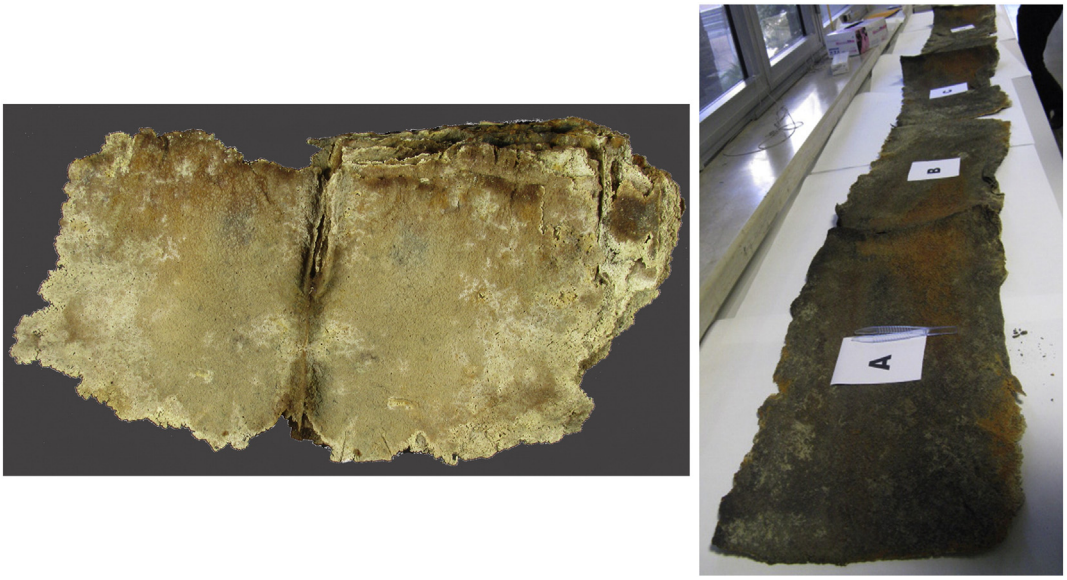

Fig. 1. The codices found under the sea. To the left: the first codex (each page cm 22 × cm 25), to the right: the long strip (cm 320 × cm 54) folded in the second codex.