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Padova, 21 settembre 2017

Other new biological evidence found on the Shroud

The result, published on the renowned journal of Applied Spectroscopy, was obtained by an international team composed of Dr. Jean-Pierre Laude (http://jplaude.monsite-orange.fr) retired Research Director of Horiba Jobin-Yvon in France, one of world leader company in advanced analytical technologies, and by Prof. Giulio Fanti of the Department of Industrial Engineering of Padua University, Italy.

Just after the recent result published on Plos One Journal by Italian researchers of CNR in collaboration with the University of Padua where creatinine with ferritin was detected in proximity of a blood stain of the Shroud, this result, made possible by micro-spectrometric studies, confirms that the Man wrapped in the Shroud was subjected to heavy torture before a cruel death.

The Holy Shroud kept in Turin from 1578 is believed by many to be the sheet in which the body of Jesus of Nazareth was wrapped after the his death by crucifixion; it has been subject to numerous technical-scientific investigations. A recent study on a flax fiber extracted from the dorsal imprint visible on the Shroud in the foot region, entitled "*Raman and Energy Dispersive Spectroscopy (EDS) Analysis of a Miscrosubstance Adhering to a Fiber of the Turin Shroud*" and conducted by an international team has been published on the renowned journal of Applied Spectroscopy.

The work has been realized in the framework of a French-Italian scientific collaboration between the expert in micro-spectroscopy *Dr. Jean-Pierre Laude (http://jplaude.monsite-orange.fr), retired Research Director of Horiba Jobin-Yvon in France*, and by Prof. Giulio Fanti of the Department of Industrial Engineering of Padua University, Italy.
The paper of Laude & Fanti, appeared on July 27 th 2017, see
http://journals.sagepub.com/doi/abs/10.1177/0003702817715291?journalCode=aspc
reports on a study performed on a not known substance adhering on a linen fiber of the Shroud , kept in Turin since 1578, which is believed by many to be the funeral fabric that wrapped Jesus of Nazareth after being crucified.
The linen fiber in question, see Figure 1, has been extracted from the blood region of the feet in the dorsal image, see the yellow arrow in Figure 2.
The Raman spectrum of the micro-substance under analysis, smeared on the fiber, see Figure 3, was compared with numerous spectra published for old or modern pigment dyes, whole bloods, dried bloods, red blood cells, albumin, very ancient blood stains, and various «degradation» products of heme. It is shown that the Raman peaks detected, could correspond to vibration frequencies found in biliverdin-derived compounds except a weak line that was tentatively attributed to amide I.

Biliverdin is known as an oxidative ring cleavage product of the heme of blood. The Energy Dispersive Spectroscopy (EDS) of the sample confirms an elemental composition fully compatible with this hypothesis. So a high correlation between the vibrational frequencies of the micro-substance adhering to the Shroud fiber and those of blood derivatives (heme/biliverdin-derived compounds and protein traces, amide I) has been demonstrated. Instead the Raman peaks, fluorescence, and EDS spectra of the substance under analysis are not compatible with those found in typical pigments like madder, purpurine, alizarin and diazo-dye. The authors also noted peaks typical of bilirubin and

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porphyrin in the spectra thus confirming the strict connection of the substance under analysis with blood derivatives.
Therefore EDS and Raman measurements performed on the not-known substance in question, strongly suggest the presence of heme/biliverdin derivatives, or aggregated fragments of biliverdin in noticeable quantity. Very likely the material smeared on the fiber contains oxidized or photo-oxidized «degradations» product of blood.

In conclusion, these new results concerning biliverdin coupled with those regarding creatinine with ferritin recently published in Plos One Journal, retraces at the micro / nanometric scale in the fiber of the Shroud a cruel scenario for the Man that was wrapped in it.

In fact a trauma produces biliverdin as a degradation of hemoglobin in the blood and creatinine with ferritin results as a degradation of the muscular fibers.
These results represent an important advance in the studies on the authenticity of the Shroud because while it is confirmed the fact that it really wrapped a man tortured to death, it is very unlikely that an artist, perhaps in the past centuries, was able to add all these details to his artwork.

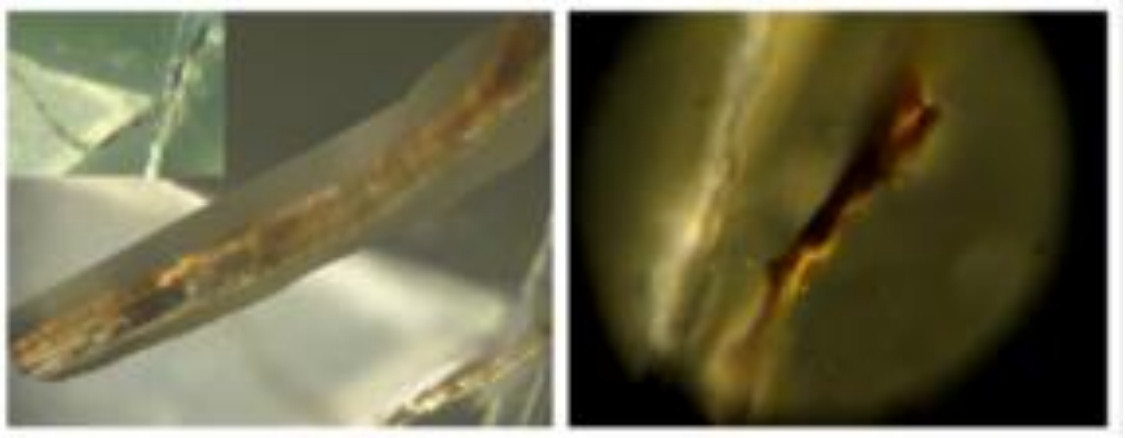

Figure 1. Shroud fiber coated by brown-orange material under examination. It is seen through an optical microscope in various magnification factors (on the left) and its end (on the right). Its diameter is about 15 micrometers, the coating has a thickness of about 2 micrometers.

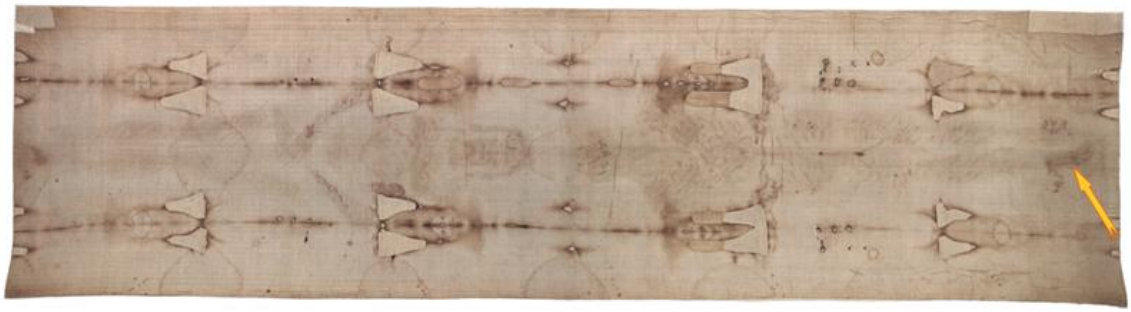

Figure 2. Image of the Shroud carrying the frontal and dorsal images of a man. The yellow arrow points to the region of the dorsal image from where it was extracted the fiber on which the experiments published on Applied Spectroscopy were performed.

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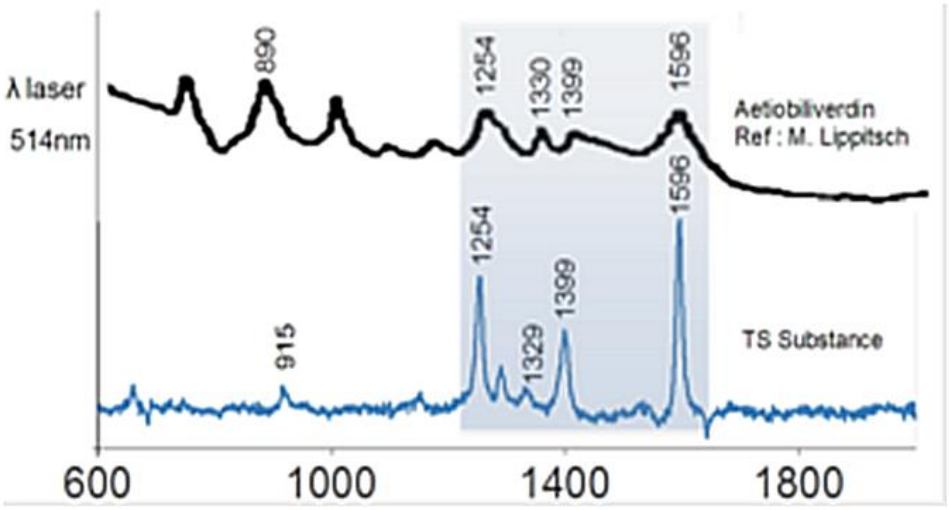

Fig. 3: Comparison of Raman spectra of the sample excited at 514 nm: aetiobiliverdin (B. Yang) (on the top) and Shroud sample (on the bottom). A part from the amplitudes that depend from the acquisition systems, the similarity of frequency peaks between the Shroud substance and aetiobiliverdin is evident.