Press release, 24/05/2019
after the conference held in Catania on 23/05/2019 entitled
Dating of the Turin Shroud: everything must be redone

Statisticians, historians, physicists, mathematicians and Turin Shroud experts have stated today that we need to reevaluate the history of the Turin Shroud, and it all starts at the University of Catania.

The laboratories that dated the Shroud in 1988 with the radiocarbon dating method produced different results non-representative of the same phenomenon. Their paper was published in Nature on 16/02/1989.

The three laboratories did not mention in the Nature article the presence of conspicuous heterogeneous material, such as ancient cotton or blue and red threads. The existence of this material in the samples was learned via other sources.

The documentation released by the British Museum to independent researcher Tristan Casabianca in 2017 depicts a more complex picture than what was presented in the Nature article: for example, Arizona realized eight measurements and these raw measurements exhibit heterogeneities.

The procedures (chosen after more than ten years of negotiations between archaeologists, textile experts and the Holy See) were very far from perfect. Those are the introductory considerations pointed out by the statistician Prof. Benedetto Torrisi during the meeting held in Catania (Sicily).

The statistical analysis, performed by the research group coordinated by Prof. Torrisi, with Dr. Giuseppe Pernagallo, Prof. Emanuela Marinelli and Tristan Casabianca, was published in Archaeometry on 22 March 2019 (Radiocarbon dating of the Turin Shroud: New Evidence from Raw Data in *Archaeometry* (2019) ed Oxford University) confirms unequivocally the heterogeneity in the radiocarbon counts used for the dating, probably because of a contaminant not removed by the preliminary cleaning process, a relevant problem in the dating process of textiles, nowadays well-established but not considered so relevant in 1988 as confirmed by Prof. Paolo Di Lazzaro, a physicist at ENEA of Frascati. Prof. Marinelli, laureate in Natural and Earth Sciences, says "the selected sample, chosen only from one point of the linen, very contaminated and mended, could not represent the entire cloth." Torrisi and Pernagallo underline the strong heterogeneity between the three laboratories and inside the laboratories as alarms of non-representativeness, from a statistical point of view, of the textile samples.

Prof. Marco Riani, statistician of Parma University, says that "the statistical tests conducted in 2012 revealed that the dates provided by the three laboratories (Arizona, Oxford and Zurich) were with homogenous variability, but significantly different."

The strongest evidence comes from the notorious Ward and Wilson test; this test and OxCal (a statistical software used by radiocarbon specialists), confirm the doubts on the official data combinability, strengthening this conclusion and providing further evidence of inhomogeneities for raw data and the individual estimates of the Arizona laboratory.

Casabianca affirms that "*The new documentation released by the British Museum also provides insight into the elaboration and acceptation of 1989 article, including the internal (Anthos Bray) and external (Nature) peer review process. For the first time, we explain the Nature review process. The documentation supports the hypothesis of a reproducibility crisis – the difficulty to replicate many scientific studies – partly based on pressure to publish, confirmation bias and data dredging. This crisis might not only affect our current knowledge of the Turin Shroud but also future robust protocols*".

Casabianca strengthens the doubts about the correctness of the results and points out the fact that the reviews, dated and relative to the article of 1989, made by the referees of Nature, now part of this documentation, were too quick (about two months) to correctly evaluate the scientific value of that work.

The mathematician Prof. Bruno Barberis of Turin University affirmed that nowadays the process that caused the formation of the image remains unknown and further empirical and theoretical studies should be performed. Hence the Shroud image must be still considered unreproducible.

The participation from the audience was important. It was asked: the presence of such a great evidence of problems in the dating was already present in 1988, why did nobody individuate what was happening? Anyway, what could be a possible solution today? Barberis answered, "It seems impossible to reconstruct what happened in 1988, I'm not Sherlock Holmes, so it would be interesting to conduct an enquiry, but further research is needed, beyond the raw data obtained by Dr. Casabianca."

Di Lazzaro says "It is surprising how the statistical expert of the British Museum who worked on the data did not note that in those data there was something wrong. But maybe there is a plausible explanation: in 1988 the accelerator mass spectrometry technique was new; it took the first steps. The people were still learning how to use it." The alternative was to require another sample, confirming the failure of the technique, so they opted for the easiest alternative! We can just imagine what the consequences would have been in admitting that the technique was not adequate. But now it's time to move on, and Prof. Di Lazzaro proposes a new possibility. Despite the C14 radiocarbon analysis today, after thirty years, it has evolved, to preserve the integrity of the linen, we could try an alternative route. From a chemical point of view the recent contaminant present in the cloth would be absent in the carbonized threads of the Chambéry fire in 1532, collected in 2002 from different points of the Shroud and preserved by the Turin Curia. That could be the starting point, fixing in mind that science is never definitive and never even aimed to provide the Truth with a capital T. Science can only provide approximations of truth, which we have shown today come closer and closer to the truth.

At this point, what emerges? The conclusions we reach, says Torrisi, are:

- ✓ No doubts should remain: the radiocarbon dating of the Turin Shroud reported in Nature was not correct due to the strong data heterogeneity.
- ✓ The sampling scheme does not offer the correct statistic representativeness of the linen. The heterogeneity among the measures provided by the laboratories depends on the area where the pieces of fabric have been cut.
- ✓ The raw data confirm unequivocally the presence of heterogeneity of the results between the three laboratories.
- ✓ Several statistical tests, parametric and non-parametric, show that the homogeneity problems of the data regard both raw and official data.
- ✓ To increase our knowledge, new multidisciplinary studies should be proposed with the purpose of gathering more data to offer a complete vision of the physical, chemical and biological characteristics of the full Shroud, in order for researchers to work on reliable data.
- ✓ A new dating is therefore necessary.

Link to the *Archaeometry* paper: Radiocarbon Dating of the Turin Shroud: New Evidence from Raw Data, T. Casabianca, E. Marinelli, G. Pernagallo, B. Torrisi, *Archaeometry*, 2019, ed Oxford University: https://onlinelibrary.wiley.com/doi/10.1111/arcm.12467