

Multidisciplinary Analysis of the Turin Shroud: digital imaging, measurements and dating

The Turin Shroud (TS) is a handmade 3:1 twill linen cloth, 4.4 m long and 1.1 m wide, on which the front and back images of a corpse are indelibly impressed. According to the Catholic Christian tradition, the TS is the burial cloth in which Jesus Christ was wrapped before being placed in a tomb in Palestine about 2000 years ago, therefore it is the most important Relic of Catholic Christianity. The Science has not demonstrated the contrary.

In 1988, the TS was radiocarbon-dated to 1260-1390 A.D., but the result is not statistically reliable and is also questionable because possible systematic environmental effects could have altered the result. The practical coincidence of the TS face with that of Christ on Byzantine coins, starting from the VII century A.D., demonstrates that it was seen in that age.

New dating methods place the TS in the first century A.D.; among them, a mechanical multi-parametric method was developed in the DII. It bases on the stress analysis. A cycling load machine was designed and built to measure breaking strength, Young modulus and loss factor of single flax fibers 2-20 mm long and having diameters of 8-30 micrometers. These mechanical properties have been compared using two dozen reference samples having ages from 3000 B.C. to 2000 A.D. thus obtaining proper calibration curves relating the mechanical property to the fiber age. Many hypotheses have been formulated to explain the double body image, impossible to be reproduced. The most reliable one is currently connected to an electrical phenomenon (Corona Discharge). With the help of experts in electric field, leaded by prof. Giancarlo Pesavento, many experimental tests have been conducted in laboratory to try to partially reproduce the TS image. The best result, reported in Figure 3, was obtained by applying a tension of 300 kV to a 1/2 scale manikin covered by a linen sheet.

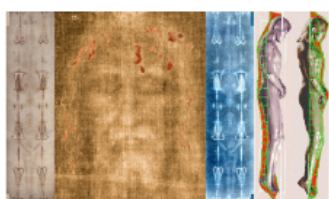


Fig. 1: Turin Shroud and its wrapping.

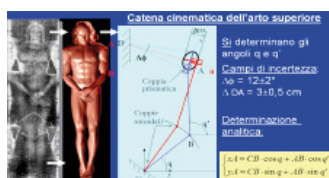


Fig. 2: Cinematic analysis of shoulder.

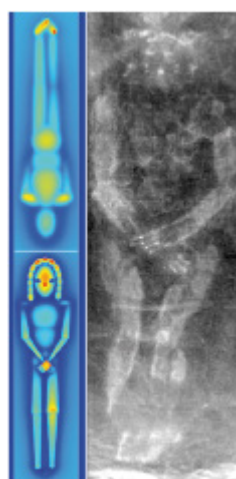


Fig. 3: Numerical and experimental results - Corona Discharge.

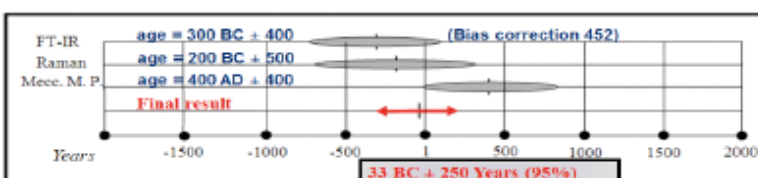


Fig. 4: Results of new dating methods (FT-IR, Raman and Multi-parametric mechanical) of the Shroud.

Ingegneria dei sistemi
meccanici
Mechanical systems

DII research group
Mechanical and Thermal
Measurements



Giulio Fanti
giulio.fanti@unipd.it
+39 049 8276804



Roberto Basso
roberto.basso@unipd.it
+39 049 8276807

www.dii.unipd.it/~giulio.fanti/research/Sindone/Sindone.htm

The research project was supported by the University of Padova (No. CPDA099244/09.); Multidisciplinary Analysis of the Turin Shroud, study of the body image, of pollution and of micro-particles.

Collaborations:

- Shroud of Turin Education and Research Association, Inc. (STERA, Inc., USA),
- Turin Shroud Center of Colorado (TSC, USA)

Main research topics:

- Scientific studies on the Turin Shroud
- Mechanical analysis of textile fibres
- Image analysis and processing
- Measurement uncertainty analysis
- Testing