

Why is the Turin Shroud Authentic?



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What is the Shroud

The Shroud of Turin [1-7], the Holy Shroud or simply the Shroud (Figure 1) is the archaeological object, as well as religious, more studied in the world. It is in fact the only Relic that boasts not only dozens of publications in specialized scientific journals, but also hundreds of books in dozens of different languages; you cannot count the articles and notes that come out almost daily in the newspapers and on the web.

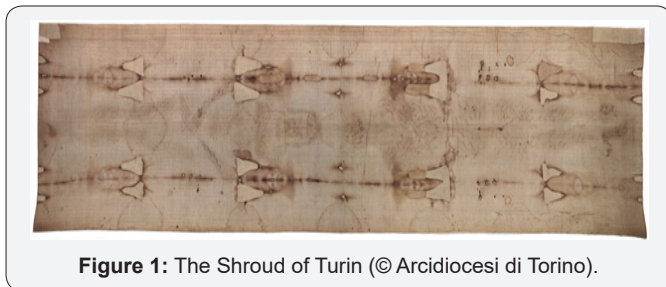


Figure 1: The Shroud of Turin (© Arcidiocesi di Torino).

The Shroud is an ancient linen cloth, 4.4m long and 1.1m wide, which enveloped the corpse of a tortured man, scourged, crowned with thorns, crucified and pierced by a spear in the chest. Many are convinced that the Shroud is the sepulchral cloth of Jesus Christ resurrected there after about forty hours from the wrapping. The double body image there impressed has been the subject of intense studies especially during the twentieth century, but even today, it is not technically reproducible and cannot even be explained scientifically.

On the Shroud, various signs are visible [2,8], important and not easily comprehensible at first glance, also because their partial overlap complicates the identification. We can see: the double mirror image, frontal and dorsal, of a man, the bloodstains corresponding to the wounds of the Man that was wrapped, the stains caused by water, the traces and the holes caused by the fire of Chambéry of 1532 and other minor signs.

The Shroud is an object of great scientific interest for its body image still unexplainable today, but it is also an object of great religious interest because many persons are convinced that it shows some traces of the Resurrection of Jesus Christ. This fact has aroused some logical-deductive problem. Unfortunately, many researchers tend to confuse the religious aspects with the scientific ones and, if this is the case, it is very easy to find objective-oriented documents. Believers [2] sometimes try to

find proofs of authenticity even by using facts that are not strictly scientific and sometimes connected to phenomena of pareidolia; non-believers [6], on the other hand, seem sometimes blind to scientific evidence that is not in accordance with their beliefs.

Here we will try to consider only the scientific aspects of the problem, avoiding the possible interference of other kinds, especially religious, even to try to dampen the controversy that has emerged in recent times on this subject. Since many topics are very complex, we reserve the right to investigate any points of interest in possible subsequent interventions.

The Authenticity of the Shroud

Very frequently, there is also a heated discussion about the authenticity of the Shroud, without however clarifying what is the subject of the discussion, or what is meant by authenticity. For someone, the authenticity consists simply in the fact that the Shroud is not of European medieval manufacture, as some mistakenly speculate, but of Eastern-Middle Eastern manufacture, executed 2000 years ago. However, other hypotheses could not be discarded; for example, even the hypothesis that the body image had been realized by an extraterrestrial intelligence or that it was the result of a miracle, would lead to the authenticity.

Others intend to authenticate the Shroud only if it has enveloped the body of a man who suffered all the tortures inflicted on Jesus. Others still define it as authentic only if it has wrapped Jesus Christ. Finally, other more demanding define it as authentic only if it enveloped the body of the Resurrected who left his body image impressed by rising from the dead and emanating an energy. Obviously, in the latter case, the answer goes outside of science, because this discipline is not able to treat the Resurrection phenomenon that is not reproducible.

By authenticity we mean here a burial sheet, of very ancient manufacture, about 2000 years ago, which wrapped the corpse of a severely scourged man, crowned with thorns, crucified and dead, who could be identified with Jesus of Nazareth. In this case, the conditional is necessary because it is not currently possible to identify with full scientific certainty the name of the person who was wrapped in the Shroud, even if the correlation between what is detected experimentally on the Relic and what we read in the Gospels helps a lot to recognize this Man.

A brief Historical Mention

The origin of this linen Sheet is still unclear today, characterized by a very precious manual weaving of the type 3: 1 that seems to have been built for high-ranking priests with a "Z" type twist, instead of the normal "S" weaving. Following recent DNA analysis from the dust aspirated by the Relic, it appears to be of Indian origin [27]. In the first century AD, trade between the Palestinian area and India was flourishing and it cannot be excluded that this sheet was bought by a wealthy Jerusalem person for burial.

Many historians [2,7], by identifying the Shroud with the Mandylion, see then the Relic in Edessa, the current Salinurfa in Turkey in the early centuries until it reached Constantinople until its fall in 1204. This last fact is shown not only by a rich iconographic research but also by a recent numismatic analysis of the Byzantine coins [8] minted from 692 AD, which depict a face of Christ very similar to that of the Shroud. A probabilistic calculation that considers a series of details common to the two representations comes to affirm that the engraver of one of these coins would have had just seven odds on a billion different possibilities to spot all the features together, without having seen the Shroud.

After more than a century of unclear paths, the Shroud appeared in Lirey in 1353, and it was subsequently kept in Chambery from 1502. There, in 1532, it suffered the famous fire that seriously damaged it. In 1578, it was brought to Turin where it remains until today, except for some sporadic hiding during the wars; for example, during the last WWII, it was brought to Montevergine.

Dating

Although the Shroud linen fabric is at first sight very old because it is yellowed and woven by hand, it is still very well preserved and resistant. In 1988, a sample of a few centimeters was taken from a corner and radiocarbon dated by three famous laboratories [9]: Oxford, Zurich and Tucson in Arizona: it turned out to be an age of 1325 AD with uncertainty of ± 65 years, but this result was widely criticized [10-13] both for procedural and statistical problems.

Five different methods, independent of each other, instead agree with the assignment of the first century AD as probable age when the artifact was built. A Project of the University of Padua (CPDA-099-244) has allowed the development of alternative methods of chemical and mechanical dating. The chemical methods, based on FT-IR / ATR and Raman spectroscopy, dated the Shroud at 300 BC \pm 400 years and 200 BC \pm 500 with a confidence level of 95% respectively. The high uncertainty associated with the result is mainly since the Raman spectra are influenced by the fluorescence while the FT-IR / ATR spectra are influenced by thermal factors. The linen of the Shroud was in fact exposed at a temperature of about 200 °C during the fire of 1532.

The mechanical method based on the analysis of some parameters such as the breaking strength, the Young's modulus and the loss factor appeared more promising though more complex. After an adequate calibration of the method, based on the results of two dozen samples of known age, a Shroud age of 400 AD \pm 400 years emerged with a 95% confidence level.

To these three methods, Raman, FT-IR and mechanical the numismatic method that sees the Shroud before the seventh century AD must be added. Another chemical method developed by the chemist Raymond Rogers [14], based on estimates of the kinetic constants for the loss of vanillin from lignin, sees the Shroud posed in an ancient period from 1000 BC to 700 AD.

The Blood

On the Shroud, it is possible to observe different blood drippings:

- a. Those due to the insertion of the nails during the crucifixion,
- b. The more than 370 wounds produced by the scourges,
- c. The blood wound of the side produced by the spear of the Roman centurion to verify the death of the Crucifix and
- d. The wounds on the forehead, temples and nape due to the crown of thorns.

Some of these drippings have been analyzed by means of adhesive tape samples put directly in contact with the Relic. Samples of blood crust have been analyzed and the blood resulted considerably deteriorated. The ageing of the blood material caused part of the deterioration, but the main alteration derives from the exposure to the sixteenth-century fire that partly changed the chemical composition; analysis by Raman spectroscopy [15] in fact confirmed this characteristic with experimental tests.

The blood so deteriorated is very brittle and easily disperses into the environment, so it is easy to think that these blood traces have faded over time, so they almost disappeared at the sight of the observer. Consequently, it can be thought that in the past centuries such bloodstains have been reinforced by means of pigments such as red ochre and cinnabar. Both pigments were found together [15] with the Shroud blood. Recently, spectrometric analyses showed the presence of biliverdin [16], caused by the degradation of hemoglobin in the blood of the Shroud, typical of a traumatized person.

The Impossible Image

Perhaps the most interesting point from the technical-scientific point of view of the Shroud research concerns the body image that to date is neither reproducible nor explainable in all its very particular characteristics (Figure 2).

Since 1998, when Secondo Pia took the first photographs of the Relic and allowed scientists to study more closely the body

image of the Shroud, dozens and dozens of scholars have tried to reproduce the Shroud image but without success. As the scientists of STURP stated, who in 1978 performed the most detailed scientific analysis on the Sheet, what can be reproduced from the macroscopic point of view is impossible from the microscopic point of view and vice versa. This is not the place to detail these characteristics [17] and the different hypotheses [18,19] proposed by scholars to explain the formation of the image. Here we limit ourselves by observing that the explanation must include a hypothesis of a phenomenon acting at a distance generated by the inside of a corpse wrapped in the sacred Linen.



Figure 2: Face of the Shroud of Turin. The bloodstains (in positive as they appear on the Shroud) have been superimposed to the negative image.

Among the hypotheses that seem most promising, there is that connected to a strong electric field that generates the so-called corona discharge. Experimental tests carried out in collaboration with Giancarlo Pesavento [20] of the Department of Industrial Engineering of Padua University (Italy) have confirmed the achievement of a good part of the Shroud's characteristics reported in the literature, although obviously not all.

The Shroud Wrapped a Corpse for a Short Time

There are many particularities still not well clarified related to the Shroud image, one of them is the following. The Shroud was certainly used as a funerary sheet [21] to wrap a man, but this Man was wrapped there for no more than forty hours. Normally, the corpses remained in the wrapping sheet until their complete rotting, but in this case, the image of the human body does not show the slightest sign of putrefaction, a phenomenon that begins about forty hours after death. In addition, the cadaveric rigidity of this Man, also confirmed by new studies [22,23] of three-dimensional reconstruction of the human body wrapped there, is a phenomenon of relatively short duration that disappears after a few tens of hours.

Therefore, some questions arise that are not easy to answer from a purely scientific point of view. For obvious

scientific reasons we exclude here to consider the effects of that phenomenon reported in the Gospels as Resurrection. Why then the corpse wrapped in the Shroud remained wrapped there for a few days only? Where that corpse went after the burial, because of corpse we must talk based on other scientific data found on the Relic?

In addition to these problems, we must remember that the blood leaked from the wounds of the Man was dissolved by fibrinolysis in the damp environment of the sepulcher. Therefore, any tampering with the corpse would have produced smears on the imprints of the wounds that are instead perfectly transferred also in correspondence of the glutei, on the dorsal image, area where certainly some crawling would have occurred during the movement of the corpse.

Why is the Turin Shroud Authentic?

If, as discussed above, by authenticity of the Shroud is meant a funerary sheet, of very ancient manufacture, of about 2000 years ago, that wrapped the corpse of a man hard tortured and dead on a cross, all the scientific clues considered seem favorable to this hypothesis.

Six [8, 10-14] out of seven independent dating methods (and [9] has been widely criticized) indicate that this linen Sheet is datable to a period including the first century after Christ. The most important Relic of Christianity wrapped a corpse. The blood traces correspond to those of a tortured man. The body image cannot be explained, but the most reliable hypotheses refer to an intense and probably very brief burst of energy. The corpse, endowed with considerable corpse rigidity, remained wrapped in the Shroud for a short period, not exceeding forty hours. All these clues therefore confirm the authenticity of the Shroud [27].

As St. John Paul II stated, "The Shroud is a provocation to intelligence... The Church entrusts scientists with the task of continuing to investigate", but for the moment scientists have not been able to provide definitive answers. We must recognize, however, that man who is limited produces Science, so Science is also limited as a result. Will Science be able to explain the phenomenon of the Shroud in the future?

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