

New Light on the Shroud

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The clamor of the radiocarbon test

Almost thirty years have passed since the Shroud was subjected to the C 14 test that branded it as a medieval fake. Thirty years of new studies, research, analysis and discoveries that have remained in the shadow compared to the world fame conquered by the unfortunate radiocarbon verdict of October 13, 1988.

The response was not accepted uncritically by the Church. In the statement by Cardinal Anastasio Ballestrero, Archbishop of Turin and Custodian of the Shroud, the evaluation of the results of the examination was referred to science. This was not the last official pronouncement by the Vatican; in fact in the Bulletin of the Press Room of the Holy See of August 18, 1990 we read: «The result of medieval dating was to constitute a singular point, even in contrast, with respect to the previous results, which were not contradictory with a dating dating back to 2000 years does. It is an experimental datum among others with the validity and also the limits of the sectoral exams that are to be integrated in a multidisciplinary framework ».

The need for multidisciplinary research for the correct dating of a textile artifact is highlighted by Beta Analytic, the world leader in radiocarbon tests: this laboratory performs tissue dating only under certain conditions, which were lacking in the examination conducted on the Shroud. On the Beta Analytic website (<https://www.radiocarbon.com/radiometric-plus.htm>) we read: "The well-preserved fabric samples, with a good structure and not treated with preservative materials generate precise results.

Samples taken from a fabric treated with additives or preservatives generate a false radiocarbon age. To ensure that the sample can be dated, please send a description of the fabric or a high resolution photo that allows a preliminary evaluation to the laboratory. " And it is specified: "The laboratory does not perform the dating of fabrics or other objects of high or inestimable value, unless the payment and the sending of the sample are made by a state institution, a museum or another recognized institution that is studying materials within a multidisciplinary research process. It is possible to send the material through a professional archaeologist who declares that the sample is suitable for radiocarbon dating ".

The Shroud during its history may have undergone alterations that have influenced the radioactivity. And those who have followed the events of the relic test closely know that the procedures followed to carry out that analysis were not all regular.

Textile expert John Tyrer of the AMTAC Laboratories in Altrincham, UK, expressed his concerns about the contaminants, particularly those introduced by the fire that damaged the relic in Chambéry, France, in 1532.

The corner which was chosen for the collection is particularly polluted, because it has been touched countless times to expose the Shroud. Leoncio Garza-Valdés and Stephen Mattingly, two microbiologists from the University of Texas Health Science Center in San Antonio, in the United States, noted that some Shroud fibers, in the sampling area for dating, are coated with a patina of bacteria and mushrooms that

cannot be removed with conventional cleaning methods. This patina can alter the dating of even 500-600 years.

A spectroscopic survey conducted by biochemist Alan Adler of Western Connecticut State University in Danbury, in the United States, has proved particularly interesting: it turned out that the samples used for radiocarbon analysis are not representative of the rest of the fabric. Adler considers a restoration plausible and stated: "This is an area that has obviously been repaired"

Sindonologists Joseph Marino and Sue Benford provided a series of evidence of the existence of an "invisible" mend of the sixteenth century in the area from which the sample was taken, including differences in color, wire size and texture. Their research was confirmed by chemist Raymond Rogers of the Los Alamos National Laboratory in Los Alamos, in the United States.

Numerous criticisms have also been made of the statistical analysis of the results. Consequently, the manufacture of the Shroud in the mid-14th century cannot be placed on the basis of radiocarbon dating performed in 1988.

Three new analyzes, conducted by engineer Giulio Fanti, associate professor of mechanical and thermal measurements at the Department of Industrial Engineering of the 'University of Padua, date the Shroud to the time of Christ. Some relic fibers have undergone two chemical dating, based on FT-IR vibrational spectroscopy - from English Fourier Transform to Infra Red - and Raman. The third dating method is mechanical, the result of the work done by the engineer Pierandrea Malfi for the achievement of the master's degree in Mechanical Engineering, under the supervision of Fanti. To conduct the experimental mechanical tests on linen fibers, a traction machine for vegetable textile fibers was specially designed and built. The average of the values resulting from the two chemical and mechanical datings gives the most probable date of the Shroud of $33 \text{ BC} \pm 250$ years at the 95% confidence level. These new datings therefore report the origin of the Shroud at the time of Christ.

The scientific certainties achieved

The fabric of the Shroud is of herringbone linen and is of great value: in the necropolis of Antinoe, in Upper Egypt, in tombs of wealthy people funeral cushions have been found dating to the beginning of the second century AD, with herringbone woven edges. So the man who was wrapped in the Shroud was an important person; on the contrary, a thief or a slave had to be buried without a sheet in a mass grave. Why is a criminal buried with great honor? Who else could be this man scourged, crowned with thorns, crucified with nails, pierced to the side, if not the Christ?

The linen of the Shroud was probably a fabric of great value, available at the Temple of Jerusalem, which was used for the "royal" burial of Jesus: very fine linen fabrics were available in the Sanctuary for the needs of the clothes of the Levite priests and for the veils of the Temple. These precious fabrics also came from India. The identification, on Shroud samples, of DNA typical of the Indian populations is interesting, confirming the possible origin of the sheet. The possible Indian origin of the Shroud can be confirmed by the name itself, which can derive from Sindia or Sindien, terms used to indicate a fabric from India. It is known from the studies of the paleographer Ada Grossi that in the afternoon of Yom Kippur the High Priest dressed in fine Indian linen. The biblical scholar Maria Luisa Rigato believes that one of the precious linens available in the Temple of Jerusalem was used for the burial of Jesus. Also on

the Shroud there is a side seam identical to those existing on first-century Jewish textiles found at Masada, a hill near the Dead Sea.

Material with adhesive tapes was also taken from the Shroud. This material has been studied in different laboratories. A large abundance of Middle Eastern pollens has been found that do not exist in Europe. On the Shroud the botanist Max Frei, director of the scientific service of the Zurich police, was identified as the pollen of 77 different types of plants, most of which do not exist in Europe and 13 of which are typical and exclusive to the desert near Jerusalem. Among the most significant plants is *Zygophyllum Dumosum*, which grows only in southern Israel, western Jordan and Sinai. The pollen list, studied by the palynologist Marzia Boi of the Balearic University, reveals the presence of the most used plants to make expensive balms, which were used in the ancient funerary rites of the Middle East. On the Shroud, moreover, crystals of aragonite similar to that of the Jerusalem caves were found and the fragrant funerary spices used by the Jews in the first century were identified: aloe and myrrh.

Many investigations on the Shroud were carried out by the group of US scientists from the Shroud of Turin Research Project, a Turin Shroud Research Project. They conducted measurements and analysis on the relic for 120 consecutive hours; the results of their research have been published in prestigious scientific journals. Their conclusions are extremely interesting: "We can conclude for now that the image of the Shroud is that of a real human form of a man scourged and crucified. It is not the product of an artist. Blood stains are composed of hemoglobin and also provide a positive test for serum albumin. The image is a mystery that continues and until further chemical studies are done, perhaps by this group of scientists, or perhaps by other scientists in the future, the problem remains unresolved".

Alan D. Adler, along with biophysicist and physician John Heller of the New England Institute for Medical Research in Ridgefield, US, and physician Pierluigi Baima Bollone, director of the Institute of Legal Medicine of the University of Turin, have come, independently among them, to demonstrate the presence of blood on the Shroud. Adler points out that it is blood rich in bilirubin: this means that it belongs to a person who has suffered great trauma. Baima Bollone has shown that it is human blood of the AB group (the least common, 5% of the population); the same blood group as the Miracle of Lanciano and the Sudarium of Oviedo. It is male blood and from the very fragmented DNA it is deduced that it is ancient blood. On the fabric there is venous and arterial blood.

The Man of the Shroud was not washed: thus they prescribed the Jewish rules in case of violent death. The body was wrapped in a sheet about two and a half hours after death, already stiff. The blood had coagulated on the wounded skin and on the Shroud around the wounds there are serum halos, visible only in ultraviolet photos. This blood was redissolved due to fibrinolysis in contact with the damp cloth and from the degree of redissolving of the clots we deduce that the corpse was in contact with the sheet for about 36-40 hours; the permanence of the body in the Shroud for a limited period of time can be deduced not only from the interruption of the fibrinolytic process, but also from the absence of any sign of decomposition. The end of the contact occurred, inexplicably, without causing a movement that would have altered the edges of the traces of blood.

On the Shroud there is also the image of the body that was wrapped around it. This impression, due to degradation due to dehydration and oxidation of the flax superficial fibrils, is comparable to a photographic negative. It is superficial, detailed, thermally and chemically stable. It is also stable to water. It is not composed of pigments, it is devoid of directionality and was not caused by the simple contact of the body with the sheet: with the contact the cloth touches or does not touch, there is no

middle ground. Instead there is an image on the Shroud even where there was certainly no contact. The contrasting light/dark aspects are proportional to the different distances existing between the body and the cloth in the various points of drapery. Under the bloodstains there is no image of the body: the blood, first deposited on the sheet, has shielded the area below while, subsequently, the image was formed.

The contrasting light/dark aspects of the image can be read and reconstructed on the computer with a three-dimensional effect. A normal flat image should provide a distorted relief; on the contrary, in this case a well proportioned three-dimensional body is obtained. He was a man between thirty and forty years old, about 1.75 meters tall.

How a corpse could have impressed on the sheet the photographic image of itself is a unique and still inexplicable phenomenon. The physical-chemical mechanism at the origin of the impression is not known; however, it can be assumed that it was caused by a stream of non-penetrating radiation that fades with the passage in the air and decreases with distance.

At the ENEA (Agency for New Technologies, Energy and the Environment) in Frascati (Rome) some linen fabrics have been irradiated with an excimer laser, a device that emits high intensity ultraviolet radiation. The results, compared with the Shroud image, show interesting analogies and confirm the possibility that the image was caused by directional ultraviolet radiation. According to many physicists, such as Thomas Phillips of Harvard University in Cambridge, in the United States, the image on the Shroud may have been caused by a photoradiant effect caused by the energy released by the body of Christ at the time of the resurrection.

The mysterious image of Edessa

On September 14, 1578 Emanuele Filiberto of Savoy moved the Shroud from Chambéry to Turin. The precious relic was given to Ludovico di Savoia in 1453 by Marguerite de Charny. The noblewoman had inherited it from her grandfather, the Crusader knight Geoffroy de Charny, who had come into possession of it around 1356. His wife, Jeanne de Vergy, was a great-granddaughter of Othon de la Roche, the Crusader knight who probably carried the Shroud in France after the sacking of Constantinople in 1204.

The historian Ian Wilson believes, with sound reasons, that the Shroud arrived in Constantinople in 944 folded so as to show only the face; it was considered a miraculous imprint of Christ. This image "not made by human hands", which the Byzantines will call Mandyllion, had been preserved in Edessa since time immemorial and had been the source of inspiration for all the ancient depictions of the face of Jesus. In fact the ancient icons bear a striking resemblance to the Shroud face.

Si Hamza Boubakeur, Islamic theologian, Director of the Muslim Institute of the Mosque of Paris from 1957 to 1982, found valuable information on the Image of Edessa in Islamic sources. The fame of the precious relic made her very coveted. When the Byzantine Roman emperor I Lecapeno wanted to get hold of it, he sent the army under the command of the Armenian general John Curcuas. The emir of Edessa expected a violent attack from the eighty thousand soldiers who had come, threatening, under the walls. But General Curcuas instead began a negotiation: he was ready to save the city and release two hundred Muslim prisoners of the highest rank, adding the sum of twelve thousand silver pieces, in exchange for the simple delivery of the image.

The Emir was baffled by the request. The Christian community would have strenuously opposed the confiscation of the priceless relic and he knew it well. Uncertain of what to do, he took his time and sent a messenger on horseback to Baghdad, entrusting the decision to the caliph al-Muttaqi. Even for the caliph the choice was not simple; therefore he assembled the high magistrates and theologians (Qadi and Fuqaha) and the grand vizier "Alī ibn s̄a to subject them to the thorny question. But opinions were divided on the decision to be taken.

The discussion lasted a long time, with strong positions. All the sages expressed their respect for the image of Edessa, considered the Mindīl - or the handkerchief - of the prophet Jesus, who - according to Islamic sources - was transported to Ruhā (Arabic name of Edessa) at the beginning of the seventh century AD , after having been preserved in Ephesus, Damascus and Antioch. The Mindīl - or Ikon al Mandil - was preserved in the old cathedral (Al Kanīssa-l-Koubra). Some emperors secretly came to retire there and the tolerant Muslims turned a blind eye. One of these pious visits in the eighth century was reported to Caliph Haroun Rachid, who decided not to follow up on it.

In the thirteenth century, the historian 'Alī ibn al-Athīr wrote in his work "The complete story": « The Emperor of the Christians turned to the caliph al-Muttaqi a request: the handing over of the handkerchief with which the Christ, he claimed, had dried his face and on which his image was imprinted, which was in the district of Ruhā. The opinions were different and no one found the unusual question. This handkerchief, the ones said, has been in the land of Islam for centuries, without a Byzantine ruler claiming it at any time. Giving a favorable response to such a question would be taken for decadent people. The release of the prisoners from their captivity, the end to their suffering, to the inconvenience they endure, is preferable, said 'Alī ibn 'sā, to the conservation in our territory of this handkerchief. Sharing his point of view, the caliph gave orders to return it to the Byzantines, on the condition of freeing the Muslim prisoners. Order that the Grand Vizier had executed by sending to the Emperor a plenipotentiary to receive the prisoners who were released ". The emperor of Byzantium also undertook, at the request of the caliph, not to send other military expeditions against Edessa, which was guaranteed a perpetual immunity.

Si Hamza Boubakeur said: "Fortunate is he who, by putting himself above religious antagonisms, astonishing legends and cultural prejudices, will come to a conclusion about the historical complexity and spiritual meaning of this relic!"

The latest research

The recent scientific congress held in Pasco (USA) <http://shroudresearch.net/conference-2017.html> from 19 to 22 July 2017 has brought new results that confirm the authenticity of the Shroud. The scholars present came from different countries and the contribution of the Italian ones was remarkable, both in the historical and in the scientific sector.

The sindonologists Alfonso Caccese, Emanuela Marinelli, Laura Provera and don Domenico Repice have studied the Imago Pietatis, or the half-length Christ that rises from a well-grave with the head reclining on his right shoulder and the arms crossed in front. Various written and iconographic testimonies confirm the hypothesis that this iconographic type is inspired by the Shroud, exhibited vertically in Constantinople with a mechanism similar to that of the throne of the Magnaura, with which the emperor could be raised high to impress those present.

The biologist Alessandro Piana brought new elements to confirm the presence of the relic in Athens in 1205, after the looting perpetrated by the Crusaders in the Byzantine capital. In that year he had become Lord of Athens Othon de la Roche, who returned to France after 1225, probably bringing the Shroud with him. After his death in 1234, the Shroud remained the property of his family until he arrived at Jeanne de Vergy, his descendant of the fifth generation, who along with her husband Geoffroy de Charny exhibited her in Lirey in the mid-fourteenth century.

The genetic investigation carried out on Shroud samples is very promising. The geneticist Gianni Barcaccia, who had detected on the Sinsone the conspicuous presence of DNA of Indian and Middle Eastern origin, emphasized that in particular the very rare haplogroup H33 is interesting, because it is found mainly at the Drusi, an ethnic minority present in Israel, Jordan, Lebanon and Syria.

The face of Christ inspired by the Shroud is present on numerous Byzantine coins. Giulio Fanti demonstrated how numerous details, derived from the observation of the relic, characterize the Byzantine coins starting from 692, the year in which the Emperor Justinian II for the first time had the face of Christ represented on these coins. With time this resemblance faded, but strengthened again in conjunction with the arrival of the Shroud in Constantinople in 944. Giulio Fanti's speeches at the congress ranged from the historical to the scientific field. In the previous days, Fanti's name had traveled around the world for an important research published on PlosOne: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0180487>

This survey was conducted by the Department of Industrial Engineering of Padua, where he teaches, Fanti, in collaboration with the physicist Elvio Carlino, of the Institute of Materials of the CNR of Trieste, and the physicists Liberato De Caro and Cinzia Giannini, of the Institute of Crystallography of the CNR of Bari. This group of scientists, which uses the most advanced microscopy tools, found on a Shroud fiber traces of biological creatinine nanoparticles, a chemical substance produced by muscle metabolism, linked to iron oxide nanoparticles. The distribution of the iron oxide nanoparticles reveals that they cannot be dyes for painting, but are small ferritrite particles of ferritin, a protein that constitutes the body's iron reserve in tissues. The constant binding of ferritin to creatinine occurs in the human body in the event of severe polytrauma. This research confirms, therefore, that the Man of the Shroud was the victim of heavy torture before a bloody death, torture confirmed by the presence of biliverdin. <http://journals.sagepub.com/doi/abs/10.1177/0003702817715291>

At the congress, Fanti also presented the experimental results of a study, conducted with the engineer Gianmaria Concheri and the sculptor Sergio Rodella on a specially-made statue, which shows how the Man of the Shroud was wrapped tightly by the Shroud; the sheet was not simply placed on the corpse as some had suggested in the past. The color of the blood stains, which has remained redder over the centuries than would be expected, was discussed by the physicist Paolo Di Lazzaro who presented a work conducted in collaboration with the doctor Antonio Di Lascio and the physicists Paola Iacomussi, Mauro Missori and Daniele Murra. The purpose of the work was to verify the various hypotheses formulated in the past. The most valid was that of the hematologist Carlo Goldoni: ultraviolet radiation can change the structure of bilirubin; this strengthens the red color of the blood stains over a long period. Irradiation with a UV lamp of bilirubin-rich blood stains resulted in a permanent red-yellowish colouration after four years.

To an intense radiation as the cause of the formation of the image, during a process of annihilation of matter and antimatter at the time of the Resurrection, Giuseppe Baldacchini added, in his hypothesis, a

neutron flux that distorted the result of the radiocarbon dating of 1988, placing the origin of the Shroud in the Middle Ages. Regarding the causes of Jesus' death, cardiologist Pietro Pescetelli based himself on his experience to formulate the well-founded hypothesis that the final cry on the cross and the exit of blood and serum from the pierced side can be explained with a heart attack followed by rupture of the heart and flooding of the pericardium. Noteworthy were also the contributions of the other congress members, coming from Spain, France, United States, Mexico and Australia, who provided further historical and scientific reasons to confirm the authenticity of the venerated relic.

For further information:

Emanuela Marinelli - Marco Fasol, *Luce dal Sepolcro*, Faith & Culture, Verona 2015

Emanuela Marinelli - Livio Zerbini, *La Sindone, history and mysteries*, Odoya, Bologna 2017

<http://www.sindone.info>