
The Shroud of Turin - Evidence it is authentic

Below is a summary of scientific and historical evidence supporting the authenticity of the Shroud of Turin as the ancient burial cloth of the historical Jesus of Nazareth.

by J. Michael Fischer, adapted from the original article by John C. Iannone

THE SHROUD AS AN ANCIENT TEXTILE

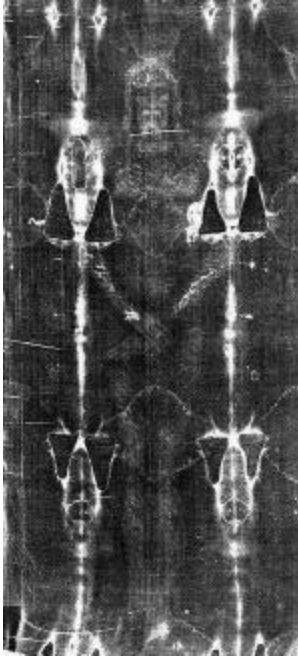


The Shroud is a linen cloth woven in a 3-over-1 herringbone pattern, and measures 14'3" x 3'7". These dimensions correlate with ancient measurements of 2 cubits x 8 cubits, consistent with loom technology of the period. The finer weave of 3-over-1 herringbone is consistent with the New Testament statement that the "sindon" (or shroud) was purchased by Joseph of Arimathea, a wealthy man.

In 1532, there was a fire in the church in Chambéry, France, where the Shroud was being kept. Part of the metal storage case melted and fell on the cloth, leaving burns, and efforts to extinguish the fire left water stains. Yet the image of the man was hardly touched.

In 1534, nuns sewed patches over the fire-damaged areas and attached a full-size support cloth to the back of the Shroud. This became known as the "Holland" backing cloth.

The Shroud was moved to Turin in 1578, where it remains to this day.



In 2002, a team of experts did restoration work, such as removing the patches from 1534 and replacing the backing cloth. One of the specialists was Swiss textile historian Mechthild Flury-Lemberg. She was surprised to find a peculiar stitching pattern in the seam of one long side of the Shroud, where a three-inch wide strip of the same original fabric was sewn onto a larger segment.

The stitching pattern, which she says was the work of a professional, is quite similar to the hem of a cloth found in the tombs of the Jewish fortress of Masada. The Masada cloth dates to between 40 BC and 73 AD.

This kind of stitch has never been found in Medieval Europe.

1988 CARBON-14 TEST REFUTED

The 1988 Carbon-14 tests done at Oxford, Zurich and Arizona Labs used pieces of the same sample cut from a corner (lower left of above pictures).

1. A paper published in Jan 20, 2005 in the journal *Thermochimica Acta* by Dr. Ray Rogers, retired Fellow with the Los Alamos Scientific Laboratory and lead chemist with the original STURP science team (the 1978 Shroud of Turin Research Project, involving approximately 35 scientists directly examining the Shroud for five days), has shown conclusively that the sample cut from The Shroud of Turin in 1988 was taken from an area of the cloth that was re-woven during the middle ages. Here are some excerpts:

"Pyrolysis-mass-spectrometry results from the sample area, coupled with microscopic and microchemical observations, prove that the radiocarbon sample was not part of the original cloth of the Shroud of Turin. The radiocarbon date was thus not valid for determining the true age of the shroud."

"As part of the Shroud of Turin research project (STURP), I took 32 adhesive-tape samples from all areas of the shroud and associated textiles in 1978." "It enabled direct chemical testing on recovered linen fibers and particulates".

"If the shroud had been produced between 1260 and 1390 AD, as indicated by the radiocarbon analyses, lignin should be easy to detect. A linen produced in 1260 AD would have retained about 37% of its vanillin in 1978..."

The Holland cloth, and all other medieval linens, gave the test [i.e. tested positive] for vanillin wherever lignin could be observed on growth nodes. The disappearance of all traces of vanillin from the lignin in the shroud indicates a much older age than the radiocarbon laboratories reported."

"The fire of 1532 could not have greatly affected the vanillin content of lignin in all parts of the shroud equally. The thermal conductivity of linen is very low... therefore, the unscorched parts of the folded cloth could not have become very hot." "The cloth's center would not have heated at all in the time available. The rapid change in color from black to white at the margins of the scorches illustrates this fact." "Different amounts of vanillin would have been lost in different areas. No samples from any location on the shroud gave the vanillin test [i.e. tested positive]." "The lignin on shroud samples and on samples from the Dead Sea scrolls does not give the test [i.e. tests negative]."

"Because the shroud and other very old linens do not give the vanillin test [i.e. test negative], the cloth must be quite old." "A determination of the kinetics of vanillin loss suggests that the shroud is between 1300- and 3000-years old. Even allowing for errors in the measurements and assumptions about storage conditions, the cloth is unlikely to be as young as 840 years."

"A gum/dye/mordant [(for affixing dye)] coating is easy to observe on... radiocarbon [sample] yarns. No other part of the shroud shows such a coating." "The radiocarbon sample had been dyed. Dyeing was probably done intentionally on pristine replacement material to match the color of the older, sepia-colored cloth." "The dye found on the radiocarbon sample was not used in Europe before about 1291 AD and was not common until more than 100 years later." "Specifically, the color and distribution of the coating implies that repairs were made at an unknown time with foreign linen dyed to match the older original material." "The consequence of this conclusion is that the radiocarbon sample was not representative of the original cloth."

"The combined evidence from chemical kinetics, analytical chemistry, cotton content, and pyrolysis-mass-spectrometry proves that the material from the radiocarbon area of the shroud is significantly different from that of the main cloth. The radiocarbon sample was thus not part of the original cloth and is invalid for determining the age of the shroud."

"A significant amount of charred cellulose was removed during a restoration of the shroud in 2002." "A new radiocarbon analysis should be done on the charred material retained from the 2002 restoration."

Raymond N. Rogers. 20 January 2005. Studies on the radiocarbon sample from the shroud of turin. *Thermochimica Acta*, Vol. 425, Issue 1-2, Pages 189-194.

2. The Fire-Model Tests of Dr. Dmitri Kouznetsov in 1994 and Drs. John Jackson and Propp in 1998, which replicated the famous Fire of 1532, demonstrated that the fire added carbon isotopes to the linen.

Dmitri Kouznetsov, Andrey Ivanov, Pavel Veletsky. 5 January 1996. Effects of fires and biofractionation of carbon isotopes on results of radiocarbon dating of old textiles: the Shroud of Turin. *Journal of Archaeological Science*, Volume 23, Issue 1, Pages 109-121. doi:10.1006/jasc.1996.0009

Jackson, John P. and Propp, Keith. 1997. On the evidence that the radiocarbon date of the Turin Shroud was significantly affected by the 1532 fire. *Actes du III Symposium Scientifique International du CIELT*, Nice, France.

NEW TESTS DATE THE SHROUD

New experiments date the Shroud of Turin to the 1st century AD. They comprise three tests; two chemical and one mechanical. The chemical tests were done with Fourier Transform Infrared Spectroscopy (FTIR) and Raman spectroscopy, examining the relationship between age and a spectral property of ancient flax textiles. The mechanical test measured several micro-mechanical characteristics of flax fibers, such as tensile strength. The results were compared to similar tests on samples of cloth from between 3250 BC and 2000 AD whose dates are accurately known.

FTIR identifies chemical bonds in a molecule by producing an infrared absorption spectrum. The spectra produce a profile of the sample, a distinctive molecular fingerprint that can be used to identify its components.

Raman Spectroscopy uses the light scattered off of a sample as opposed to the light absorbed by a sample. It is a very sensitive method of identifying specific chemicals.

The tests on fibers from the Shroud of Turin produced the following dates: FTIR = 300 BC \pm 400 years; Raman spectroscopy = 200 BC \pm 500 years; and multi-parametric mechanical = 400 AD \pm 400 years. All the dates have a 95% certainty. The average of all three dates is 33 BC \pm 250 years (the collective uncertainty is less than the individual test uncertainties). The average date is compatible with the historic date of Jesus' death on the cross in 30 AD, and is far older than the medieval dates obtained with the flawed Carbon-14 sample in 1988. The range of uncertainty for each test is high because the number of sample cloths used for comparison was low; 8 for FTIR, 11 for Raman, and 12 for the mechanical test. The scientists note that "future calibrations based on a greater number of samples and coupled with ad hoc cleaning procedures could significantly improve its accuracy, though it is not easy to find ancient samples adequate for the test."

They used tiny fibers extracted from the Shroud by micro-analyst Giovanni

Riggi di Numana, who gave them to Fanti. Riggi passed away in 2008, but he had been involved in the intensive scientific examination of the Shroud of Turin by the STURP group in 1978, and on April 21, 1988 was the man who cut from the Shroud the thin 7 x 1 cm sliver of linen that was used for carbon dating.

These tests were carried out in University of Padua laboratories by professors from various Italian universities, led by Giulio Fanti, Italian professor of mechanical and thermal measurement at the University of Padua's engineering faculty. He co-authored reports of the findings in 1) a paper in the journal *Vibrational Spectroscopy*, July 2013, "Non-destructive dating of ancient flax textiles by means of vibrational spectroscopy" by Giulio Fanti, Pietro Baraldi, Roberto Basso, and Anna Tinti, Volume 67, pages 61-70; 2) a paper titled "A new cyclic-loads machine for the measurement of micro-mechanical properties of single flax fibers coming from the Turin Shroud" by Giulio Fanti and Pierandrea Malfi for the XXI AIMETA (Italian Association of Theoretical and Applied Mechanics) congress in 2013, and 3) the 2013 book "Il Mistero della Sindone" (The Mystery of the Shroud), written by Giulio Fanti and Saverio Gaeta in Italian.

IMAGE FORMATION VERSUS WORK OF AN ARTIST

No one knows for sure how the images were created. **The images are scorch-like, yet not created by heat, and are a purely surface phenomenon limited to the crowns of the top fibers.** The Shroud is clearly not a painting; no evidence of pigments or media was found. The blood was on the Cloth before the image because there is no image beneath the shroud (an unlikely way for an artist to work). There is no outline, no binders to hold paint, no evidence that paint, dye, ink, or chalk created the images, and there are no brush strokes. According to world-renowned artist Isabel Piczek, the images have no style that would fit into any period of art history. The images show perfect photo-negativity and 3-dimensionality. It is not a Vaporgraph or natural result of vapors.

Note: some microscopic particles of paint exist on the Shroud, but these do not constitute the image. During the Middle Ages, a practice called the "sanctification of paintings" permitted about 50 artists to paint replicas of the Shroud and then lay their paintings over the Shroud to "sanctify" them. This permitted contact transfer of particles, which then migrated around the cloth with the folding and rolling of the Shroud when it was opened for exhibit and closed again afterwards.

STURP determined that the image was caused by rapid dehydration, oxidation and degradation of the linen by an unidentified process, coloring it a sepia or straw yellow. Several Physicists, including Dr. John Jackson of the Colorado Shroud Center, suggest that a form of columnated radiation is

the best explanation for how the image was formed, leaving a scorch-like appearance (the scorch caused by light versus heat, as the image does not fluoresce). Dr. Thomas Phillips (nuclear physicist at Duke University and formerly with the High Energy Labs at Harvard) says a potential miliburst of radiation (a neutron flux) could be consistent with the moment of resurrection. Such a miliburst might cause the purely surface phenomenon of the scorch-like (scorch-by-light) images, and possibly add Carbon-14 to the Cloth. As Dr. Phillips points out: "We never had a resurrection to study" and more testing should be done to ascertain whether a neutron-flux occurred.

The coloration on the linen fibers on the Shroud is extremely thin. Sticky tape samples taken from different parts of the image on the Shroud's surface in 1978 were too thin to measure accurately with a standard optical microscope, which means they were thinner than the wavelength of visible light, or less than about 0.6 micrometers. A more recent measurement of the coloration on one of the fibers was found to be about 0.2 micrometers thick (or one-fifth of a thousandth of a millimeter).

Italian scientists working at the National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) conducted experiments on their own time between 2005 and 2010, applying ultraviolet radiation to strips of linen to see if they could match the coloration on the fibers of the Shroud of Turin. In their ENEA technical report, published in November 2011, they wrote that particular doses of radiation left a thin coating on linen fibers that resemble the colored fibers on the image of the Shroud of Turin. When questioned, the lead scientist in the study, Paolo Di Lazzaro, said that vacuum ultraviolet radiation (VUV, wavelength 200-100 nanometers) from laser pulses lasting less than 50 nanoseconds produced the best effect.

These findings support the idea that the image on the Shroud was made by a sudden flash of high-energy radiation. They also refute the possibility of forgery, since lasers were obviously not available in medieval times.

The technical report: P. Di Lazzaro, D. Murra, E. Nichelatti, A. Santoni, G. Baldacchini: "Colorazione similindonica di tessuti di lino tramite radiazione nel lontano ultravioletto: riassunto dei risultati ottenuti presso il Centro ENEA di Frascati negli anni 2005-2010" RT/2011/14/ENEA (2011).

BLOOD EVIDENCE (vs. PAINT THEORY)

Most bloodstains on the Shroud are exudates from clotted wounds transferred to the cloth by contact with a wounded human body.

The blood on the Shroud is real, human male blood of the type AB (typed by

Dr. Baima Ballone in Turin and confirmed in the U.S.). This blood type is rare (about 3% of the world population), with the frequency varying from one region to another. Blood chemist Dr. Alan Adler (University of Western Connecticut) and the late Dr. John Heller (New England Institute of Medicine) found a high concentration of the pigment bilirubin, consistent with someone dying under great stress or trauma and making the color more red than normal ancient blood. Drs. Victor and Nancy Tryon of the University of Texas Health Science Center found X and Y chromosomes representing male blood and "degraded DNA" (approximately 700 base pairs) "consistent with the supposition of ancient blood."

Four Italian scientists used atomic resolution Transmission Electron Microscopy (TEM) and Wide Angle X-ray Scanning Microscopy to investigate the nanoscale properties of a pristine fiber taken from the Turin Shroud. This is the first time that the Shroud of Turin has been studied at this resolution. The fiber, about two millimeters long, comes from the area of the feet on the backside (dorsal) image.

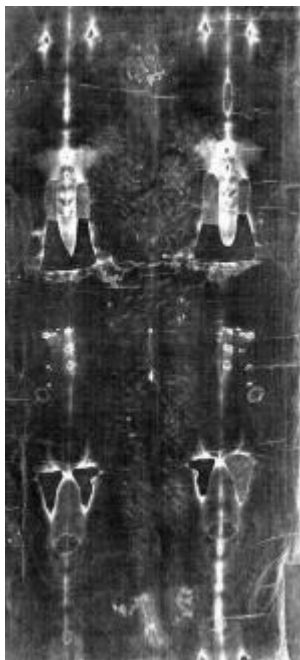
The fiber is covered with creatinine nanoparticles 20-100 nm in size embedding small (2-6 nm) nanoparticles made of defective ferrihydrite typical of biologic ferritin cores. This is not typical of the blood serum of a healthy human being. High levels of creatinine in the blood are observed in the case of severe trauma. Other research has noted the interaction between creatinine and ferritin in fatal accidents or as a consequence of the rhabdomyolysis due to torture.

The peculiar structure, size and distribution of the iron oxide nanoparticles found on the fiber exclude ancient dyes for painting which are, in general, on the scale of hundreds of nanometers. Red ochre and vermilion organic and inorganic particles have sizes at least one hundred times bigger than those observed here.

This study shows that the Shroud of Turin is covered by well-dispersed creatinine nanoparticles bound with ferrihydrite structures. The bond between the iron cores of ferritin and creatinine on a large scale occurs in a body after a severe polytrauma. This result cannot be put on the Shroud by using ancient dye pigments, as they have bigger sizes and tend to aggregate, and it is highly unlikely that an ancient artist would have painted a fake by using the hematic serum of someone after a heavy polytrauma. "Hence, the presence of these biological nanoparticles found during our TEM experiments point to a violent death for the man wrapped in the Turin shroud."

Carlino, Elvio, Liberato De Caro, Cinzia Giannini, Giulio Fanti. 30 June 2017. Atomic resolution studies detect new biologic evidences on the Turin Shroud. PLoS ONE Vol. 12, No. 6, 13 pages. DOI:10.1371/journal.pone.0180487

PATHOLOGY OF THE WOUNDS OF CRUCIFIXION AND THE SIGNATURE OF THE HISTORICAL JESUS



The image on the Shroud is of a man 5 feet 10 ½ inches tall, about 175 pounds, covered with scourge wounds and blood stains. Numerous surgeons and pathologists (including Dr. Frederick Zugibe (Medical Examiner - Rockland, New York), Dr. Robert Bucklin (Medical Examiner - Las Vegas, Nevada), Dr. Herman Moedder (Germany), the late Dr. Pierre Barbet (France), and Dr. David Willis (England)) have studied the match between the Words, Weapons and Wounds, and agree that the words of the New Testament regarding the Passion clearly match the wounds depicted on the Shroud, and that these wounds are consistent with the weapons used by ancient Roman soldiers in Crucifixion.

Specifically, the scourge marks on the shoulders, back, and legs of the Man of the Shroud match the flagrum (Roman whip) which has three leather thongs, each having two lead or bone pellets (plumbatae) on the end. The lance wound in the right side matches the Roman Hasta (4cm x 1 cm spear wound). Iron nails (7" spikes) were used in the wrist area (versus the palms as commonly depicted in Medieval art). These marks, combined with the capping of thorns which is not found anywhere else in crucifixion literature of ancient Roman (Tacitus, Suetonius, Pliny the Elder or Pliny the Younger) or Jewish (Flavius Joesphus, Philo of Alexandria) historians create a unique signature of the historical Jesus of Nazareth.

BURIAL CONSISTENT WITH ANCIENT JEWISH BURIAL CUSTOM

The burial is consistent with ancient Jewish burial customs in all respects, including the use of cave-tombs, attitude of the body (hands folded over loins), and types of burial cloths. The Sindon (Shroud) enveloped the body. The Sudarium was a face-cloth used to cover the face out of respect during removal from the cross through entombment. It was then removed and placed to one side. There was also a chin-band holding the mouth closed. The Othonia were bandages used to bind the wrists and legs. All are

mentioned in the New Testament and evidenced on the Cloth. Such cloths are spoken of in the Misnah - oral traditions of the Rabbis written down in the second and third century.

The Cave-Tombs were carved out of sides of limestone hills. The presence of Calcium Carbonate (limestone dust) on the Cloth was noted by Dr. Eugenia Nitowski (Utah archaeologist) in her studies of the cave tombs of Jerusalem. Optical Engineer Sam Pellicori noted in 1978 the presence of dirt particles on the nose as well as on the left knee and heel. Prof. Giovanni Riggi noted burial mites. Dr. Garza-Valdes discovered oak tubules (microscopic splinters) in the blood of the occipital area (back of the head) as well as natron salts. Traces of aloe and myrrh have also been identified on the Cloth. These are consistent with Jewish burial customs of antiquity.

HISTORICAL REFERENCES

Persian King Chosroes I attacked the Byzantine city of Edessa in 544 AD but was repulsed. Evagrius Scholasticus (born 536 AD), in his 590 AD book *Ecclesiastical History*, wrote that the people of Edessa believed an image of Christ of "divine origin" allowed them to destroy the siege mound. This is the first reference to the Image of Edessa being a divinely created image (acheiropoieta, meaning "not made by human hands").

The legend of King Abgar V, ruler of the city of Edessa (400 miles north of Jerusalem in Turkey) from 13 to 50 AD, locates a cloth with the image of Jesus in Edessa, though it is not called a burial shroud. It says that Jesus was given a towel, and when He had washed Himself, He wiped His face with it. His image having been imprinted upon the linen, He sent it to Abgar with a message. The Acts of Holy Apostle Thaddaeus (6th Century) calls the cloth a tetradiplon (cloth doubled-in-four). This Greek term only appears twice in historical texts, and both times refers to the Image of Edessa. Dr. John Jackson's raking light test in 1978 confirmed tetradiplon fold marks in the Shroud. If it is folded in half three times, the Shroud of Turin displays only the face of the man. There is a famous icon from the 10th century that depicts the image of Edessa being held by Abgar:



In 943 AD the Byzantine Emperor Romanus I sent an army of 80,000 men to besiege the Muslim-held city of Edessa in order to take the Image of Edessa. The cloth was given up, and on August 15, 944 AD it arrived in the Byzantine capitol Constantinople. The *Narration De Imagine Edessena*, written one year later gives a history of the Image including the legend of Abgar, and tells of a private viewing of the Image by the future emperor Constantine VII and his two brothers-in-law, the sons of Emperor Romanus. One of the most famous Medieval Greek writers, monk Symeon Magister Metaphrastes, wrote the *Chronicle* around 944, which describes the same event. These documents report that Constantine could see only a faint image, like a “moist secretion, without pigment or the painter’s art”. The other two men were said to be barely able to make out an image at all because it was so faint.

The next day, August 16, the population welcomed the Image to the city. Archdeacon Gregory Referendarius gave a public sermon in which he spoke of the legend of Abgar, and then said “...this reflection... has been imprinted only by the sweat from the face of the originator of life... For these are the beauties that have made up the true imprint of Christ, since after the drops fell, it was embellished by drops from his own side. Both are highly instructive – blood and water there, here sweat and image.” Till then the cloth had only been reported to have a facial image.

In 958 AD, Emperor Constantine VII sent a letter to his army which was engaged near Tarsus. To inspire them, he mentioned “...the sacred linens, the sindon which God wore, and other symbols of the immaculate passion.” “Passion” refers to the suffering and death of Christ. Thus he states clearly that the burial cloth (sindon) was in the possession of the Byzantine Empire.

In 1201 AD, Nicholas Mesarites, overseer of the Imperial Relic Collection in Constantinople, published an inventory. It includes “...burial sindones of Christ” that “wrapped the... naked body after the Passion... In this place He rises again...”

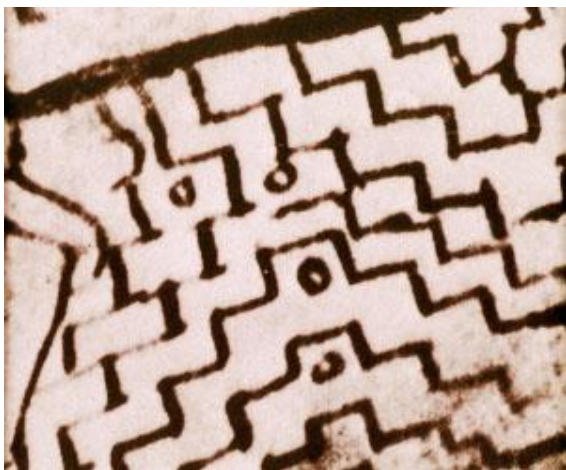
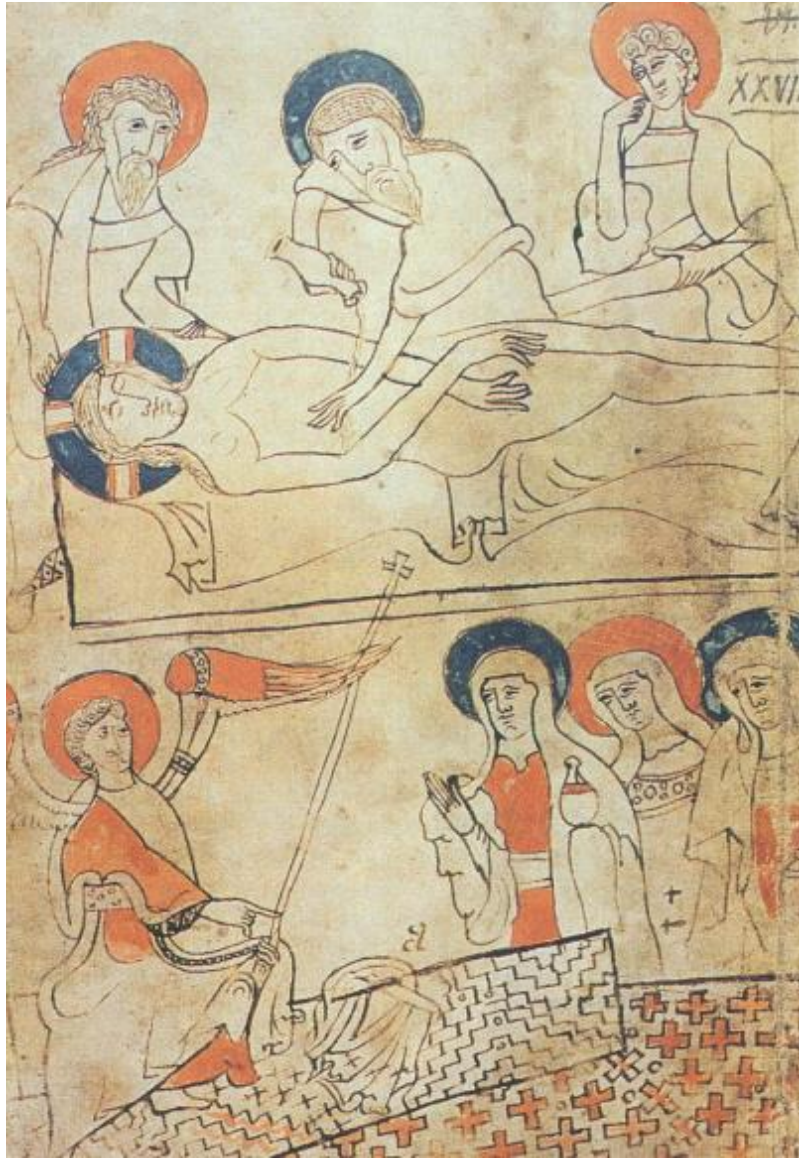
The French Crusader knight Robert de Clari wrote in his memoirs that the "sindoinies in which our Lord had been wrapped" was kept in a church and displayed every Friday, until it disappeared in 1204 with the attack and looting of Constantinople by French Crusaders during the Fourth Crusade.

The Shroud was displayed in 1355 in the French town of Lirey. It was in the possession of a famous Templar Knight, Geoffrey de Charny, who claimed it was the cloth that "wrapped the Lord Jesus Christ after his death".

SHROUD ILLUSTRATED IN THE PRAY MANUSCRIPT

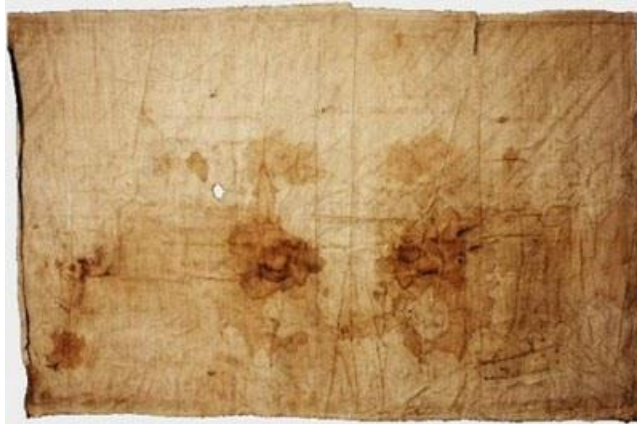
In the Budapest National Library is the Hungarian Pray Manuscript, or Pray Codex, the oldest surviving text in the Hungarian language. It was written between 1192 and 1195 AD (65 years before the earliest Carbon-14 date in the 1988 tests). One of its illustrations shows preparations for the burial of Christ. The picture includes a burial cloth with the same herringbone weave as the Shroud, plus 4 holes near one of the edges. The holes form an "L" shape. This odd pattern of holes is found on the Shroud of Turin. They are burn holes, perhaps from a hot poker or incense embers that predate the 1532 fire. There are four sets of the holes, showing how the Shroud must have been folded in four layers when the holes were made. The holes in the top layer are large, and they get progressively smaller in the next three.





THE SUDARIUM CHRISTI - THE FACE CLOTH OF CHRIST

In the Cathedral of Oviedo in northern Spain is a linen cloth called the Sudarium Christi, or the Face Cloth of Christ. It is often referred to as the Cloth of Oviedo. The Sudarium Christi is a poor-quality linen cloth, like a handkerchief, measuring 33 by 21 inches. Unlike the Shroud of Turin, it does not have an image. However, it does have bloodstains and serum stains from pulmonary edema fluid which match the blood and serum patterns and blood type (AB) of the Shroud of Turin.



The Sudarium Christi has a well-documented history. One source traces the cloth back as far as 570 AD. Pelayo, Bishop of Oviedo in the 1100's, noted in his Chronicles that the Oviedo Cloth left Jerusalem in 614 AD in response to an attack led by Persian King Chosroes II, and made its way across North Africa to Spain. It was transported to Oviedo in a silver ark (large box) along with many other sacred relics. The Sudarium was never in contact with the Shroud since its arrival in Spain around 711 AD.

The Oviedo Cloth was placed around the head at the time of death on the Cross and remained there until the body was to be covered by the Shroud in the Garden Tomb. Then it was removed and placed to one side (John 20:7). Oviedo scholar Mark Guscini notes that the practice of covering the face is referenced in the Talmud (Moed Katan 27a). He adds that Rabbi Alfred Kolatch of New York talks of the Kevod Ha-Met or "respect for the dead" as the reason for covering the head. Rabbi Michael Tuktzinsky of Jerusalem in his *Sefer Gesher Cha'yim* (Volume 1, Chapter 3, 1911) offers as a reason that it is a hardship for onlookers to gaze on the face of a dead person.

According to Guscini, studies by members of the Spanish Centre for Sindonology (Dr. Jose Villalain, Jaime Izquierdo and Guillermo Heras of the University of Valencia) using infrared and ultraviolet photography and electron microscopy have demonstrated that this Cloth and the Shroud of

Turin touched the same face, although at different points in the burial process. They note that the length of the nose on both cloths is 8 centimeters (3 inches). Tradition and historical information support the idea that the face touched by both cloths was that of the historical Jesus of Nazareth.

Those interested in the work of Oviedo scholar Mark Guscini can read about it in his book *The Oviedo Cloth*, 1998, The Luttenworth Press, Cambridge, CT. ISBN 07188-2985-9.



Original text by John C. Iannone 1999-2001. Adapted by J. Michael Fischer from 2004 to 2017. Shroud photos courtesy of Barrie M. Schwartz 1978.

For an in-depth scientific analysis of the Shroud, see [Dr. Rogers' FAQ](http://shroudstory.wordpress.com/2012/02/26/introduction-to-ray-rogers-shroud-of-turin-faq/) at <http://shroudstory.wordpress.com/2012/02/26/introduction-to-ray-rogers-shroud-of-turin-faq/>