

Is the Shroud of Turin Genuine?

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トリノの聖骸布は本物か？

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Abstract

The Shroud of Turin is a long cloth kept in the Cathedral of Turin, Italy. On the cloth is a faint image of a man with the marks of crucifixion. There are also bloodstains which match. When it was first photographed in 1898, worldwide interest in the Shroud arose because rather than another faint image as was expected, the photographic negative showed a positive photograph-like image of a man. This image showed considerable detail that had previously been unknown. Much controversy surrounds the Shroud because it is either related directly to Jesus Christ or it is an incredibly skillful forgery. Scientific study has also been controversial with some conclusions that contradict others. However, a review of the history and research on the Shroud reveals reasonable evidence for its authenticity.

Key words : Shroud of Turin, science and religion, historical evidence of Jesus Christ

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抄 録

トリノの聖骸布はトリノの大聖堂に保存されている長い布です。その布には、礫にされた人のぼんやりしたイメージが残されています。また、礫に一致する血痕も付いています。1898年に初めて写真撮影された時、写真のネガが、ぼんやりしたイメージでなくはっきりとした人間のイメージを示したので世界中で聖骸布に対する関心が起きました。このイメージはこれまで知られていない細部を相当に示していた。布がイエス・キリストに直接関係するかそれとも巧妙に作られた偽物なので聖骸布に関して多くの議論が起きました。科学的研究もある結論が他の結論を否定したりして論争の余地を残している。しかしながら、聖骸布に関する歴史と調査研究の概観してみると聖骸布が本物であることを示す合理的な証拠があることを示している。

キーワード：トリノの聖骸布、科学と宗教、イエス・キリストの歴史的証拠

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Introduction

There are reasons for believing that the Shroud of Turin is the cloth which covered the body of Jesus Christ after his burial. On the other hand, for many people, the results of the Carbon 14 tests done on the Shroud in 1988 have settled the issue once and for all. Without further investigation, those test results have led many people to dismiss the Shroud of Turin as nothing other than a medieval forgery and fake. As the director of the Oxford laboratory involved in the C-14 test stated, "No one of any scientific worth [can] now believe otherwise than that the Shroud is a fake. Anyone who [thinks] otherwise might as well join the Flat Earthers" (Ruffin, 1999, p. 119). However, there is evidence beyond the Carbon 14 tests that supports the authenticity of the Shroud. Studies of the Shroud of Turin involve many fields, including history, religion, art, textile analysis, and several fields of science. Using evidence from all of these sources is more reliable than depending upon one scientific test. This paper reviews studies of the Shroud in several areas and research showing why the Carbon 14 tests should not be taken a final determination of the Shroud's authenticity.

The Shroud

Before going to the history of the Shroud, an introduction to the Shroud as it exists today is in order. (See Appendix 1 for some images.) First of all, the Shroud is now kept in the Turin Cathedral in a sealed bulletproof glass container filled with inert gas to preserve it. The Shroud of Turin is a linen cloth measuring 4.6 by 1.1 meters. The size of the Shroud is significant because in the units of measurement used in first century Palestine, the Shroud is exactly eight by two cubits (Kilmon, 1977). The front and back image of a man on the Shroud is its most striking feature. The image indicates that the position of the body was lengthwise over one half of the Shroud. The Shroud was then folded in half over the body with the center of the fold at the head. Unlike the photographs taken of it, when the Shroud itself is viewed up close, the image fades away and becomes indistinguishable from the rest of the cloth. Viewed from two or more meters away, the image can be seen (Wilson, 1998 p. 4). The image is only on the topmost linen fibers. Each linen fiber is as much as five times smaller than a human hair in diameter. One researcher, Dr. Eric Jumper

followed along the length of the image fibers and found that as the yellowed uppermost fibers dipped down under another thread, they were no longer yellow but remained their original white. Likewise, as the fibers followed a normal twist of the thread, the top fibers were yellowed while the lower part of the fibers remained white. (Lavoie, 2000, pp. 61-62)

There is a very strong scientific consensus that the image on the Shroud is not a painting. There is no evidence of any paint and the coloring that creates the image "is identical to the aging of linen, causing linen to turn from white to yellow" (p. 61).

What is most unusual about the image is that its negative forms a positive image. This means that the image on the Shroud is a kind of negative image and only when it is reversed can the positive image be seen. If the Shroud is a medieval forgery as some people believe, there has still been no credible explanation for how the image was formed. Even artists today cannot create negative pictures of anything with lifelike accuracy such as is revealed by the image in the Shroud.

There is also blood on the Shroud showing wounds that match the Biblical description of the mocking, scourging, and crucifixion that Jesus suffered. Blood stains and the image indicate that the face was struck, that the body had been beaten by a Roman whip with metal dumbbell shaped tips, that blood flowed downward from around the head as would be expected from a crown of thorns, and the right shoulder was scraped as would be expected from carrying the crossbar used for crucifixion. Both knees show scraping and wounds consistent with falling on a stone pavement. There are wounds and blood flows from the wrist and feet that match what is expected from being nailed to a cross. Furthermore, there is a flow of blood from the side that gathered to the back of the shroud that matches being pierced by a Roman spear. The evidence of these wounds have been observed on the Shroud and confirmed by numerous medical doctors (Wilson, 1978 pp. 21-31). Doctors who have examined the Shroud have been unanimously convinced from the visual evidence that the cloth genuinely once contained a corpse, and that the corpse had suffered death by crucifixion (p. 31).

Along both sides of the human image are a series of holes that were created by a fire in 1532 (Wilson, 1978 p. 11). If one views a photograph of the Shroud taken before 2002, Those holes will stand out strikingly because of the patches that were sewn on to repair the cloth shortly after the fire. However, when a cleaning and restoration of the Shroud took place in 2002, a new backing cloth was attached to the Shroud and the patches were removed. Any photographs of the Shroud taken after the restoration will not have such pronounced patches or holes.

A Brief History of the Shroud

In order to make a case that the Shroud was not produced in medieval Europe where it appeared in public record during the 1300's, a review of its history is necessary. All four Gospels mention a linen cloth related to the death and burial of Jesus. First, we read in Matthew's Gospel, "And Joseph took the body, and wrapped it in a clean linen shroud" (27:59 NRSV). In the Gospel according to Mark we read,

And he bought a linen shroud, and taking him down, wrapped him in the linen shroud, and laid him in a tomb which had been hewn out of the rock; and he rolled a stone against the door of the tomb. (15:46)

In Luke we read of the linen shroud being wrapped around Jesus' body and the body being laid in a tomb carved out of rock (23:53). John's Gospel includes information that the burial also included spices, wrapped in linen with the body and that the burial was done according to Jewish customs (19:40).

When we read about the resurrection of Jesus, the linen shroud is also mentioned but not in every Gospel. We only read about it in Luke and John. Both of these Gospels mention that Peter saw the linen cloths after Jesus had risen from the dead (Lu 24:12 & John 20:6). Some people question why the plural word "cloths" is used in Luke and why the word "wrappings" is used in John to describe what was seen after the resurrection. One explanation for this is that following Jewish customs, a single cloth covered the top and bottom of the body and another cloth was further wrapped over the head. Some smaller strips of cloth were also used to bind the jaw and arms in place (Schwartz, 2007).

Summarizing the Gospel reports, it seems that the linen cloth related to the death and resurrection of Jesus was of enough importance to be written about in every Gospel. Among the explanations that Wilson proposes for the importance of including a description of the linen burial cloths in the Gospels is the following.

Another possibility is that all the cloths were lying flat on the bench exactly in the positions they would have assumed for the burial, but without the body. This too would have been an awesome sight, conveying that the body had literally passed through the cloths to release itself from the bonds of death. (1978, p. 45)

Of course, there was no mention of an image existing on the burial cloth as reported in the Gospels.

The history of the Shroud continues from soon after the time that the Gospels report the death and resurrection of Jesus. Wilson (1978, pp. 86-103) argues that the legend of the face of Christ impressed on a cloth known as Veronica's veil and the Mandylion of the Eastern church are most likely based upon the Shroud. Wilson further speculated that for the Jewish disciples, the burial linens would have been unclean and an image would have been troubling. There is the record of Abgar V, the king of Edessa, who had heard of Jesus and sent some inquiries. Since the disciples could no longer send Jesus to this ruler, they may have decided to send the Shroud with the image upon it, instead, since the people of Edessa, in present day Turkey, would have no problems with images. Nevertheless, Wilson thinks that rather than displaying a whole burial cloth, the disciples may have wished to avoid showing the whole bloodied image and may have folded the cloth to emphasize the face as a portrait (pp. 112-13). This might be an explanation for why, early in its history, a linen strip was apparently sewn onto one side of the Shroud which has the effect of centering the image on the cloth (pp. 54-55). If the Shroud is doubled four times, the face on the Shroud appears in the same way that paintings show the face in copies of the Mandylion (pp. 99-100). The Shroud in a case with

only the face showing and the rest of the cloth out of sight would have given a very different impression than that of the whole cloth (p. 101). Seemingly early in the history of the Shroud, it was folded and placed in a decorated frame which only showed the face. People had no idea that they were looking upon a burial cloth but rather saw a face that gave the impression of a “living” Christ. There is further historical support for this view and the cloth itself still showed evidence of folding.

A sixth-century text called *The Acts of Thaddeus* refers to such an image as a *tetradiplon*, a Greek word which literally means “doubled in four” or, put another way, folded in eight layers. Interestingly, this Greek word is not used for any other object. (Guerrera, 2000, pp. 2-3)

Besides this historical text is the evidence from raking light photographs of the Shroud taken in 1978 during the STURP examination. “...a truly significant set of ridge and valley fold marks showed up almost exactly where the ‘doubled in four’ reconstruction dictated that it should” (Wilson, 1998, p. 155-56).

To Edessa

In a *History of the Church* written about 325 by Bishop Eusebius of Caesarea there is the story of a king from A.D. 13-50 named Abgar V of Edessa. This ruler sent a message to Jerusalem asking Jesus to come and heal him. Jesus replied that he would send a follower later to cure him. Later Thaddaeus, one of the seventy who Jesus sent ahead of him as described in Luke 10:1, was sent to Edessa. Thaddaeus carried the Mandylion facing the king when he was summoned to cure him. When the king saw the image it blazed with light that only the king could see. The king rose up and was healed. He then asked to be instructed in the teachings of Christianity and allowed Thadaeus to preach to the people of the city. Many became Christians. However, after the king died, one of his sons who followed him persecuted the Christians. Then for a period of several hundred years there was no mention of the Mandylion. However, in a tenth century text called, *Story of the Image of Edessa*, it is reported that the image was found hidden in a space above one of the city gates in the sixth century. It seems reasonable to assume that during the period of persecution, some Christians in Edessa hid the Mandylion in the space above the city gate where it was preserved until its rediscovery (Wilson, 1978, pp. 107-115).

Despite the persecution of Christians following the death of King Abgar V, in following years Edessa became an important center of Christianity. In 544, the king of Persia, Chosroes Nirhirvan was leading an attack against Edessa. The historian Evagrius wrote that the Persians erected a huge mound of timber which they were moving forward towards the walls of Edessa. The Persians hoped to use the mound to scale the walls and enter the city. The people of Edessa tunneled under the walls of their city and dug under the timber mound.

but they [the Edessans] failed in attempting to fire the wood, because the fire, having no exit whence it could obtain a supply of air, was unable to take hold of it. In this state of utter perplexity they brought out the divinely made image *not made by the hands of man*, which Christ our God sent to King Abgar when he desired to see him. Accordingly, having introduced this sacred likeness into the mine and washed it over with water, they sprinkled some upon the timber. the timber immediately caught the flame, and being in an instant reduced to cinders, communicated with that above, and the fire spread in all directions. (p. 116)

News of this protective power of the image not made by the hands of man seems to have spread widely and soon copies of this image began to appear in surrounding areas. Furthermore, a huge church was erected in Edessa to house the image where it was kept with great reverence for the next four centuries (p. 125).

To Constantinople

By 940 A.D., Edessa had once again fallen under Moslem rule. The emperor in Constantinople initiated a military campaign to rescue the image. In 943 the emperor's soldiers promised the leaders of Edessa that in return for the Mandylion, Edessa would be spared, two hundred high-ranking Moslem prisoners released, twelve thousand silver crowns paid, and Edessa guaranteed perpetual immunity from attack by the emperor" (p. 126). The Christians in the city vigorously protested the removal of the image but the Moslem rulers forced obedience and the image along with copies of the correspondence between Christ and King Abgar were taken. Had this transfer of the image not taken place it is almost certain that the image would have been destroyed. Within two centuries, Turkish Moslems attacked Edessa, taking a whole year to thoroughly loot and raze the city (128-29).

The first record of the Mandylion being viewed in Constantinople was from August 15, 944 when it arrived after being taken from Edessa (p. 95). The date for its arrival, August 15, 944, was carefully chosen because that was the most important Feast of the Assumption of the Virgin Mary. The Mandylion was therefore taken to the Church of the Virgin Mary at Blachernae (p. 129). The image was carried around and through the city in holy procession. The people welcomed the image with celebrations because of its reputed protective powers.

Some time after this it seems that the Mandylion was taken out of its casing and unfolded to reveal the whole image which was on it. From around 1130 there are four references to a cloth which showed the face and whole body of the Lord (pp. 135-36). These are in contrast to references before this time to a cloth which Jesus used to wipe his face and upon which just the image of his face remained. Also, before this time, images of the dead Christ in Byzantine art showed the body wrapped like an Egyptian mummy. After this time images began to appear showing the body of Christ at the foot of the cross with women weeping

while men prepare the body for burial with “a large, double-length piece of linen, obviously intended to envelop the body over the head, a cloth we would unhesitatingly identify as a shroud” (p. 137). Another innovation in Byzantine art from this time was the depiction of Christ in death with his hands crossed over the loins as seen on the Shroud.

During the following years, with Moslem influence increasing, the rulers of Constantinople courted Western help and influence. Thus, in the late 1100's William of Tyre wrote “that the Emperor ordered to be exposed the relics of the saints, the most precious evidence of the Passion of our Lord Jesus Christ, that is the Cross, nails, lance, sponge, reed, crown of thorns, sindon, and sandals” (p. 142). Sindon is Latin for a burial shroud. Another western visitor, Robert de Clari, from France, wrote,

there was another of the churches which they called My Lady St. Mary of Blachernae, where was kept the sydoine in which Our Lord had been wrapped, which stood up straight every Friday so that the figure of Our Lord could be plainly seen there (p. 145)

Apparently, the Shroud was lifted from a sacred reliquary every Friday and displayed in a religious service at the church. However, after the city of Constantinople was taken and looted by the Crusaders in 1203, Robert de Clari wrote, “And no one, either Greek or French, ever knew what became of this sydoine after the city was taken” (p. 147).

To Europe

Wilson then proposes that the Knights Templars were the custodians of the Shroud for the next 150 years. The reasons for this are that the Shroud was unheard of for several generations. It is likely that a group rather than an individual would keep the Shroud secret in this way over such a span of time. This group had to be in some way connected with the Crusaders who looted Constantinople. The group had to be wealthy enough to not need to sell the Shroud because such a relic would be worth a fortune in that age. This implies that they likely had a Christian motive for preserving the Shroud. Finally, the group had to be related to Geoffrey de Charny who was the first documented owner of the Shroud in Europe. The Knights Templars fit all of these requirements (p. 153). Furthermore, after the fall of Constantinople the Templars came to be known for worshipping a bearded head that was venerated as their Savior. They seem to have adapted the Byzantine manner of worship and prostrated themselves before the image. For those in the surrounding society of Europe, such worship looked like idolatry and so in October 1307, the king of France ordered a secret attack to destroy the Knights Templar. The king ordered a thorough inventory of all of the Templar's goods that were captured but nothing to match the image of “worship” was found. Many of the knights were killed and others were tortured severely. Finally, in March, 1314, the head of the Templars, Jacques de Molay and the head of the Normandy order, Geoffrey de Charnay were burned at the stake. Instead of making a confession which would have led

to their release, they defended the Templars saying the group “was pure and holy, and had nobly served the cause of Christianity” (p. 165).

Wilson then speculates that Geoffrey de Charnay who was burned at the stake in 1314 was likely related to Geoffrey de Charny who was the first owner of record of the Shroud in Europe. However, Geoffrey de Charny, owner of the Shroud, died in 1356 before saying or writing anything about his possession of the Shroud. In fact, he died heroically in battle after a long and honorable military career. He put his own body forth to take a spear which had been aimed to kill his king who was fighting beside him (p. 171).

Following Geoffrey de Charny’s death, his widow, Jeanne de Vergy was reduced to near poverty. It was she who first exhibited the Shroud in Lirey, France. This was during a time in which people would make long pilgrimages to see relics and make offerings. They would also buy charms and souvenirs related to the relics. One such souvenir was found in the River Seine. It is a piece of wood with an image of the Shroud showing two priests holding it. The coat of arms to the left of the image is that of Geoffrey de Charny. The coat of arms to the right of the image is that of Jeanne de Vergy (p. 168).

Nevertheless, when the Shroud was first exhibited in 1356, the local Bishop, Pierre d’ Arcis denounced the relic as a fake. Jeanne de Vergy had no explanation for the origin of the Shroud except that it was from her husband. Her husband had left no records or explanations about how he had come to have the Shroud. That is a reasonable state of affairs if the Shroud had secretly been transferred to Geoffrey de Charny from the Templars. Geoffrey de Charny would likely still fear trouble, scandal, and possible confiscation of the Shroud if it were revealed to have come from the Knights Templars. Thus, he would have had cause to keep its origins secret, even from his own family (p. 169). As a result of these circumstances, the Shroud was withdrawn from public viewing.

Two years later, Geoffrey II, the son of Geoffrey de Charny was rewarded for his father’s service with the grant of estates. Jeanne de Vergy soon remarried to Aymon of Geneva who was a wealthy nobleman and the uncle of the man who was to become the Avignon pope, Clement VII. Then in 1389 the Shroud was again exhibited by Geoffrey II (p. 177). After Geoffrey II’s death, his daughter inherited the Shroud and eventually turned it over to the House of Savoy in 1453 (p. 186). From the time of these events to the present location of the Shroud in Turin, there is a very clear and well accepted history of the Shroud.

Scientific Support for the Shroud’s History

As colorful as the history of the Shroud is, parts of it would be pure speculation without some serious scientific support. Max Frei helped establish the history of the Shroud through his analysis of pollen found on it. Frei was the founder of the central scientific department of the Zurich, Switzerland police department. Frei used pollen analysis in his police work to

establish whether or not a suspect had been at a crime scene or not (Wilson, 1998, pp. 99, 101). On the Shroud, Frei found pollen from 58 different plant species. Of the pollen found on the Shroud, 45 out of 58 types grow in and around Jerusalem. Sixteen types only grow in arid salty habitats like that of the area near the Dead Sea. Six types of pollen are from Turkey, with two of the types exclusive to Edessa and one pollen type is from a plant found only in Constantinople. Since these pollens are types spread by insects it is not possible for them to have been blown from the Middle East to Europe where they landed on the Shroud (Antonacci, 2000, p. 111).

Also worth noting is that the leading Israeli pollen analyst Dr Aharon Horowitz, having studied Frei's list of Israel plant pollens, has expressed his view that the list convincingly established that the Shroud must have been in Israel some time in its history. (Wilson, 1998, p. 89.)

Considering that pollen evidence is used in courts of law as evidence in criminal cases and considering the expert testimony of Frei, there is a strong case to be made that the Shroud was not just a medieval European product but was present where legend and historical record point to it being, namely Jerusalem at the time of the death and resurrection of Jesus Christ. Furthermore, the pollen evidence strongly confirms the route that the Shroud took from Jerusalem to Turin.

Besides the evidence from pollen, there is also visual evidence on the Shroud to establish that it was used as a burial cloth in Jerusalem. Dr. Alan Whanger of the Duke University Medical School and his wife, Mary spent many years studying the Shroud. Dr. Whanger developed the Polarized Image Overlay Technique which enabled careful comparison between two images with one superimposed upon the other (Whanger, 1998, p. 19). Using the Polarized Image Overlay Technique and photographs of the Shroud that had been specially "processed to maximize the detail in the off-body areas," the Whangers found images on the Shroud of 28 plants that only grow in Israel (Whanger, 1998, p. 72, 78).

Of these twenty-eight plants, Frei, working from the sticky tape slides, had previously identified the pollens of twenty-five of the same or similar plants. Twenty-seven of these twenty-eight bloom in March and April, which corresponds to the time of Passover and the Crucifixion. (Whanger, p. 78)

Professor of Botany, Avinoam Danin, of The Hebrew University in Jerusalem is the most renowned authority concerning the plants of Israel. He confirmed most of the Whanger's plant identifications and found additional plant images on the Shroud. Professor Danin was convinced by the plant images that the Shroud originated in Jerusalem (Whanger, pp. 79, 80).

In addition to the pollen and visual evidence for the Shroud's existence in Jerusalem, there is also mineral evidence. Giovanni Riggi, a microanalyst from Turin studied the underside of the Shroud where he also found pollen. However, the pollen samples he found

were thickly covered with calcium and there was additional calcium stuck to the cloth. If the Shroud had been around a body which was placed in a tomb in Jerusalem, it would be reasonable to find bits of the mineral on the cloth, especially on the underside. Another researcher, Dr. Joseph Kohlbeck found samples of calcium from tombs around Jerusalem and compared them with the calcium from the Shroud. Both samples were of the same rare aragonite type with similar amounts of iron and strontium. Although there may be some other place in the world where a similar type of calcium may be found, the total evidence from history, pollen, plant images, and calcium point to the Shroud originating in Jerusalem (Wilson, 1998, pp. 104-107).

Research on the Shroud

The Shroud of Turin might have remained relatively unknown if it had not been photographed in 1898. Photography revealed that the image on the Shroud, when seen as a negative, was a striking and powerful portrait of a man. Interest in the Shroud has only increased since that time. Two years after the first photographs, the director of the Museum of Natural History and professor of anatomy at the Sorbonne, Yves Delage, together with his assistant, Paul Vignon began a study of the Shroud from copies of photographs. During a two year period, working with three other scientists, they came to several unanimous conclusions which they presented to the French Academy of Science in 1902. In their half-hour presentation they announced that the image could not have been made by any painting and they identified the Shroud as the burial cloth of Jesus. Contrary to the Academy's practice, rather than publish the presentation in the Academy's journal, no part of the presentation was even mentioned. Delage, in particular was criticized as a traitor to agnosticism and science. Delage responded to the criticism in writing and pointed out that he had been faithful to the scientific method and was not influenced by the question of religion. He regarded Christ as a person who had appeared in history and saw the Shroud as some remaining evidence of his life. He went on to write that it was many of his critics who had betrayed the scientific method (Antonacci, p. 5).

Other medical studies and other research into its origins continued but the next major phase of scientific research on the Shroud began in 1974 when the Ph.D. physicist, John Jackson, working at the U.S. Weapons Laboratory in Albuquerque decided to tackle its challenge. Something about his interest and persistence, together with the scientific challenge that the Shroud presented, attracted other researchers to join him. At Jackson's request, researchers who worked with images from space at the Jet Propulsion Laboratory found that the image on the Shroud was absolutely random; there was no directionality at all to it. If it had been produced by an artist, there would have been brush marks showing left, right, up, down, and diagonal strokes but none were present (Heller, 1983, pp. 34-35). Later, Jackson

took photographs of the Shroud to the Sandia Laboratory where it was put under a VP-8 Image Analyzer. The VP-8 Image Analyzer had been developed to interpret data sent by space probes in digital form. The Analyzer was able to produce 3-D like images from this data. Heller writes,

Suddenly, both men saw, swimming up from the electronic fog of the screen, a perfect three-dimensional image of a scourged, crucified man. ...The VP8's three-dimensional image was as stunningly different from the photograph as a statue is from a painting. The long hair, full beard and mustache, the serenity on the face of a badly battered, crucified man, came alive, giving Jackson and Mottern the eerie impression that they were gazing at an actual face of a man, not at a painting or a sculpture. (pp. 39-40)

A normal photograph or painting of a body or a face when placed under a VP-8 Image Analyzer would be severely distorted because a normal photograph or painting records light intensity and placement but not distance. The image on the Shroud was found to be of uniform color and it was the number of colored fibers that determined the shading or highlights of the image.

The VP-8 is a modified computer. It can assess things quantitatively. The images of the man on the Shroud were encoded in the number of fibrils, which is why the VP-8 could "read" them...A VP-8 can and does handle quanta of light. In effect, it sees numerically, not reflectively. The images on the Shroud are numerical, as well as reversed, as in a photographic negative. (pp. 201-202)

As news of this 3-D image spread, so did interest among scientists. A conference was organized in 1977 which included representatives of the Cathedral from Turin. The possibility of studying the Shroud itself was discussed and later, scientists from the conference were invited to Turin where they made a presentation to the Center for Shroud Studies, a group of clerics and laymen who were interested in the Shroud (p. 51). In early 1978 word came from Italy that planning should proceed for scientific research on the actual Shroud. Another conference was organized and scientific research was carefully planned. A practice session for the Turin research was scheduled for the Labor Day weekend in September 1978. Thirty-six scientists of what had then become the Shroud of Turin Research Project (STURP) gathered for this. Finally, in October, 1978, with all of the scientists assembled in Turin, a truck came carrying eight tons of scientific equipment worth over \$2.5 million (p. 99). One hundred and twenty hours of non-destructive testing soon began.

Three years plus thousands of hours of further research and analysis later, the scientists involved in STURP came together to share their findings. They were able to fulfill their purpose to explain the composition of the body image and bloodstains. Based upon clear, peer-reviewed and exhaustive testing and analysis, they presented their conclusions that no artist had made the image on the Shroud. Furthermore, the Shroud had covered the body of

a man who had undergone crucifixion. The image was composed of oxidized fibers of the linen. The blood on the Shroud was real. A second purpose of the STURP team was to explain the formation of the image but they announced that they had not been able to do so (Heller, 213-18). (See Appendix 2 for the complete STURP summary.) During the public presentation of their findings, one questioner asked, "Have you found anything that would preclude the Shroud's being authentic?" The answer was, "No" (p. 217).

Although scientists had wanted to do Carbon 14 dating of the Shroud for quite some time, the early C-14 tests required too much material that would have to be destroyed and the custodians of the Shroud would never allow it. However, in following years the technology for such testing was refined to the point that much smaller samples were required. Thus, in April, 1988 samples were taken. Problematically, a number of protocols had initially been established to insure strict scientific rigor for the tests but these protocols were largely ignored. Among the protocols was the requirement to take samples of the Shroud that would be representative of the whole cloth but when the actual cutting was done, samples were only taken from one corner. That corner is rightfully problematic because it is the corner shown in paintings of the Shroud used by clerics to hold the Shroud up by hand for public viewing (Wilson, 1998, pp. 191-192).

Related to this is the finding by Rogers (2004, pp. 4-6) that the corner of the Shroud used for the C-14 samples was not representative of the whole cloth. This was later confirmed with additional tests. Rogers found that vanillin was present in the sample area. However, vanillin is not present in the main body of the Shroud. Vanillin, produced by the decay of lignin in the flax used to make linen, eventually disappears from older cloths, such as the Dead Sea scrolls linen. According to Rogers,

If the shroud had been produced between A.D. 1260 and 1390, as indicated by the radiocarbon analyses, lignin shroud be easy to detect. A linen produced in A.D. 1260 would have retained about 37% of its vanillin in 1978. ...all other medieval linens gave the test 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. (Rogers, 2005, p. 191)

Depending on temperature and other conditions of storage, the main body of the Shroud is likely from 1,300 to 3,000 years old (Rogers, 2005, p. 192).

An explanation for the discrepancy between the dating by the C-14 method and the chemical composition of the cloth which shows a much older date was proposed by Benford and Marino (2005). They note that during the period that the Shroud was owned by the House of Savoy, there was both ample time and money to carry out what today would be called "invisible weaving" repairs to the cloth (p. 2). Chemically, the composition of the C-14 tested area is different from the rest of the cloth and the addition of fibers during repairs done in the

1500's would change the chemical composition and give a misleading date.

With evidence from history, chemistry, pollen, minerals, and images on the Shroud, the C-14 date of a medieval age for the Shroud was very troubling for many people who were familiar with all of the other data. However, similar conflict has happened in other cases of C-14 dating and as a general rule, when there is overwhelming evidence to the contrary, the C-14 dates are not used. "Good scientists do not rely on carbon dating in isolation when there is other evidence available to help confirm an accurate date" (Antonacci, p. 157).

Conclusion

In conclusion, the Shroud of Turin would not have aroused much attention if it had remained undisturbed by scientists and scientific study. Only the application of scientific technology since the photographs of 1898 has been able to reveal some of the wealth of information on the Shroud that would otherwise have remained hidden. Still, the Shroud remains an object of controversy. Sufficient evidence exists to convince many who study it that the Shroud is the genuine burial garment of Jesus Christ and that the unique image on the Shroud is related to his resurrection. Nevertheless, such a conclusion is more than can be stated with strict scientific certainty. This paper focuses on arguments in support of the Shroud's authenticity. Aside from the C-14 test, other scientific evidence and current research does not disprove the Shroud's authenticity. Among STURP members who did the most intensive research on the Shroud were agnostics and Jews, so it cannot be claimed that the results were due to biased belief. In fact, many of the scientists expected to quickly prove the Shroud a fake. However, many such scientists who were skeptical at first have ended up spending the rest of their lives in further study of the Shroud.

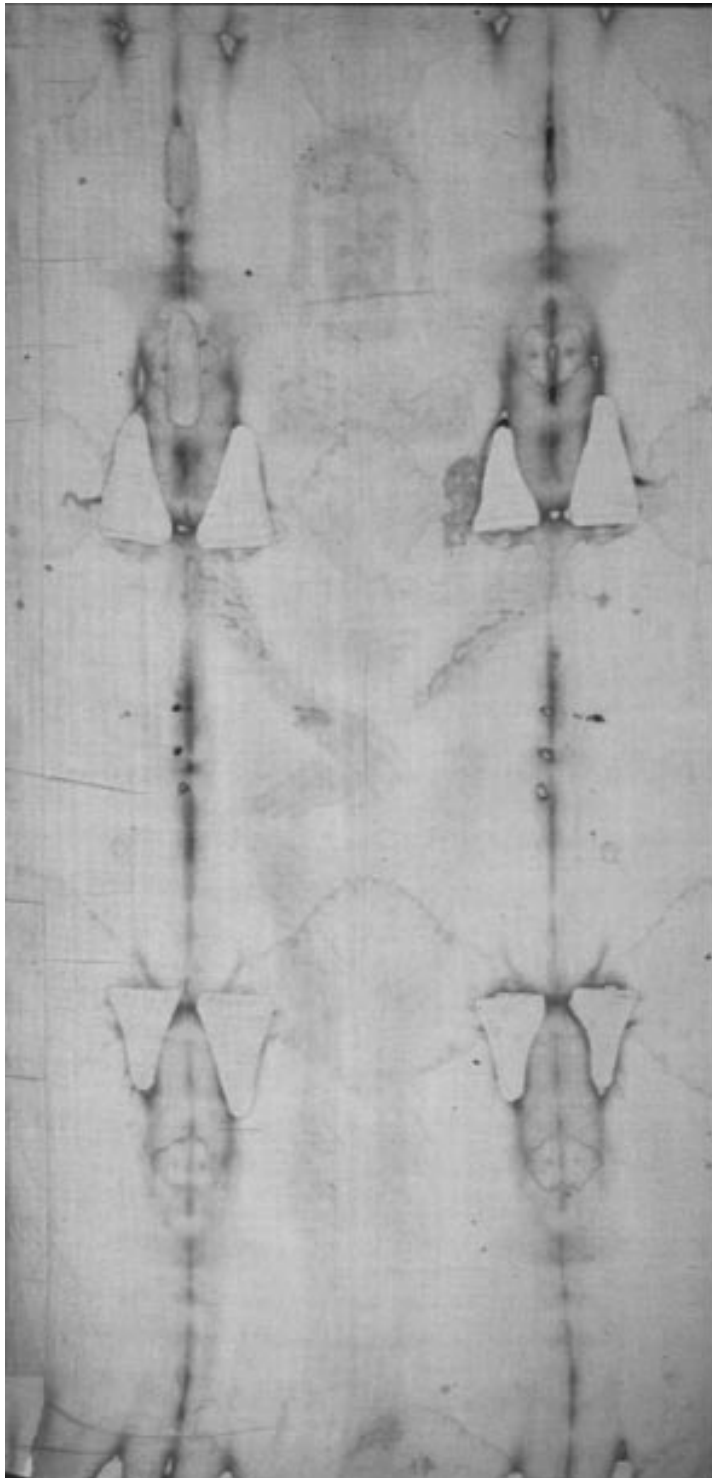
"The Shroud bears the image of a man who has had incredible, violent damage done to his body, yet whose face is filled with serenity and peace" (Heller, p. 220). The Shroud continues to attract interest because it is a challenge to both science and faith.

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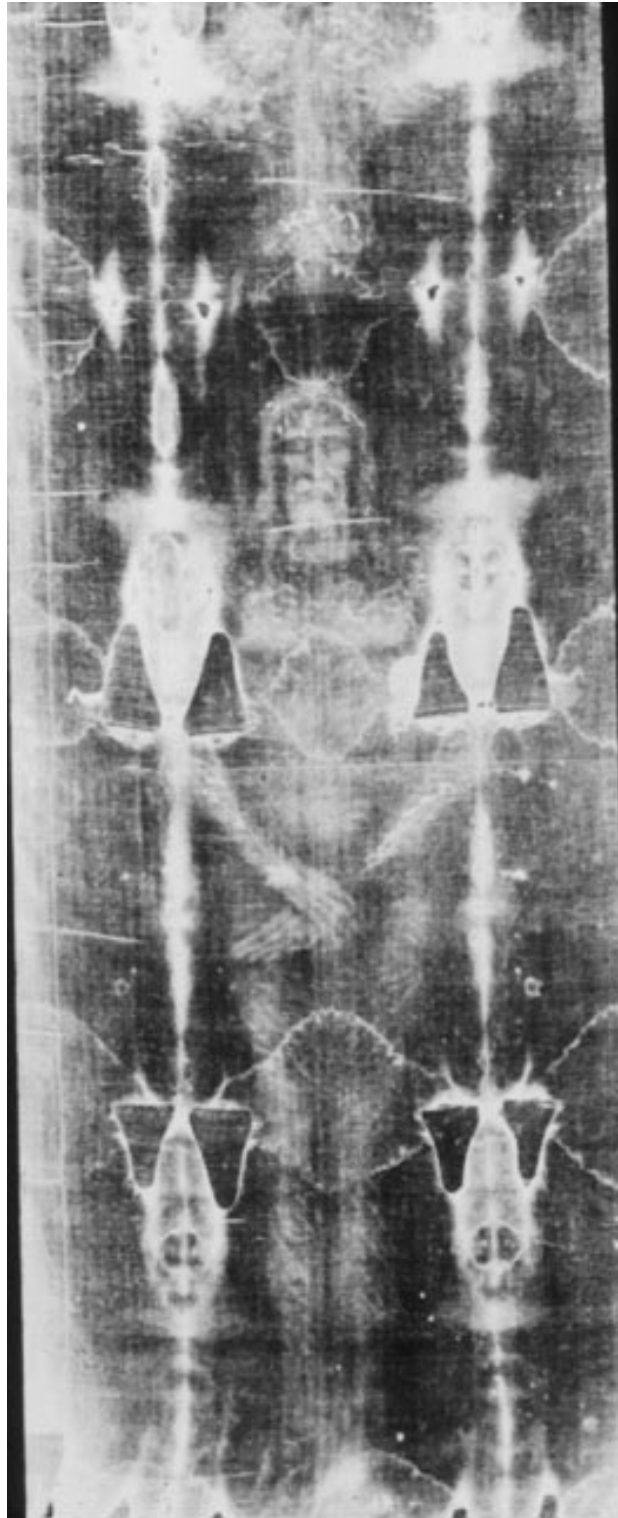
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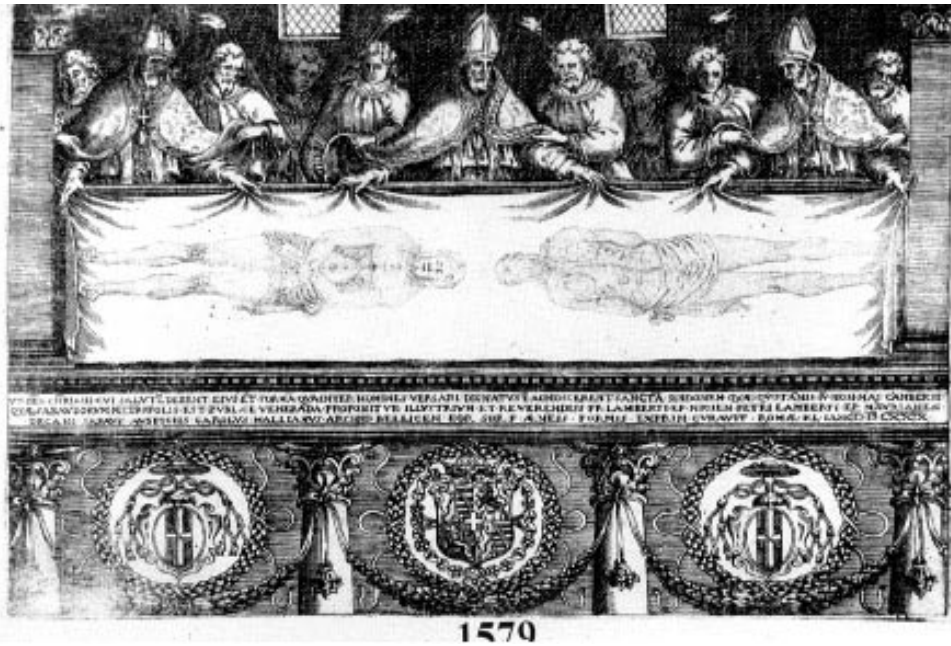
Appendix 1



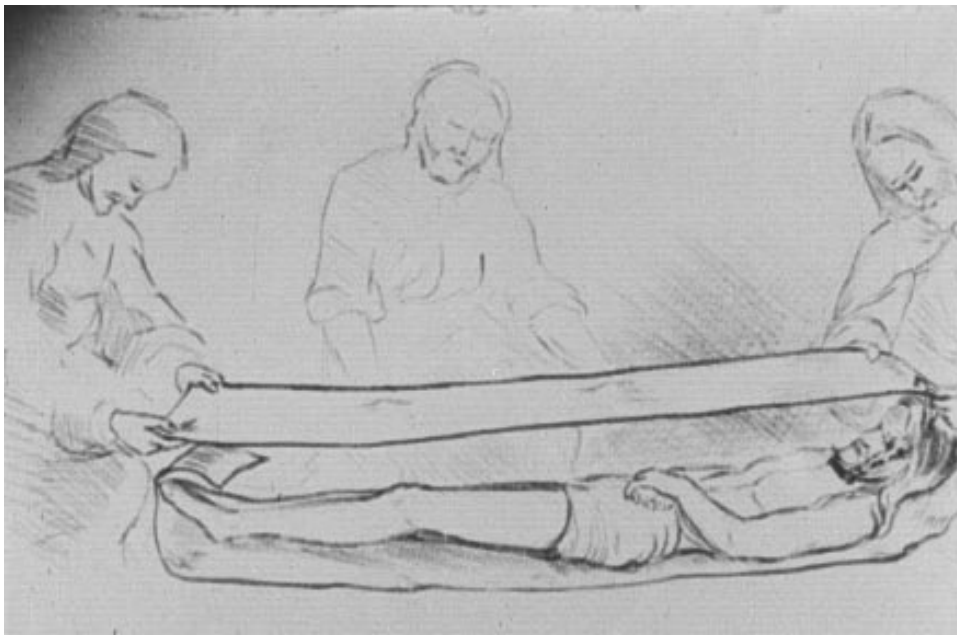
A front view of the Shroud in photographic positive.



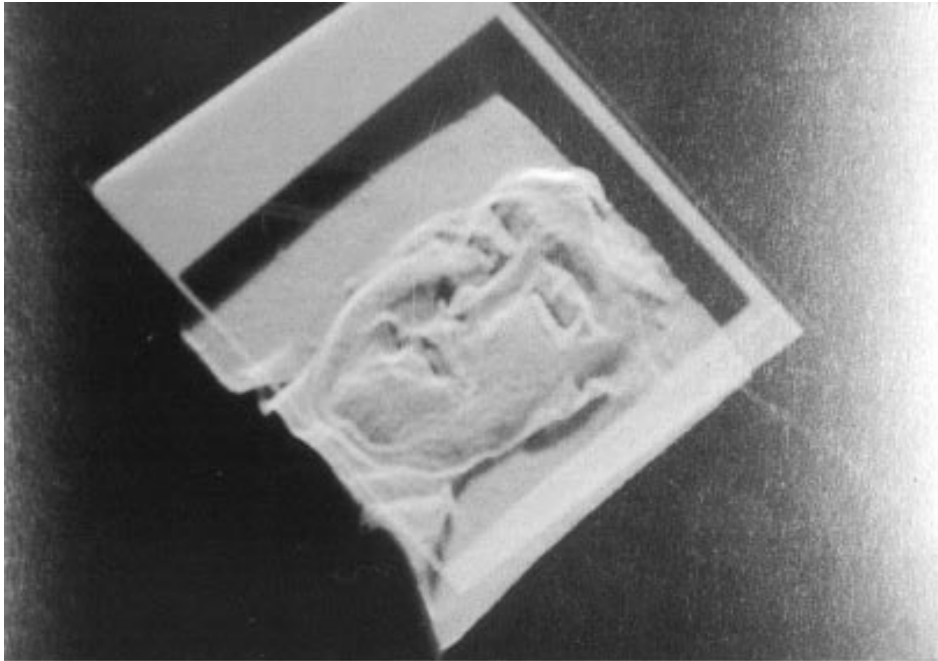
A front view of the Shroud in photographic negative.



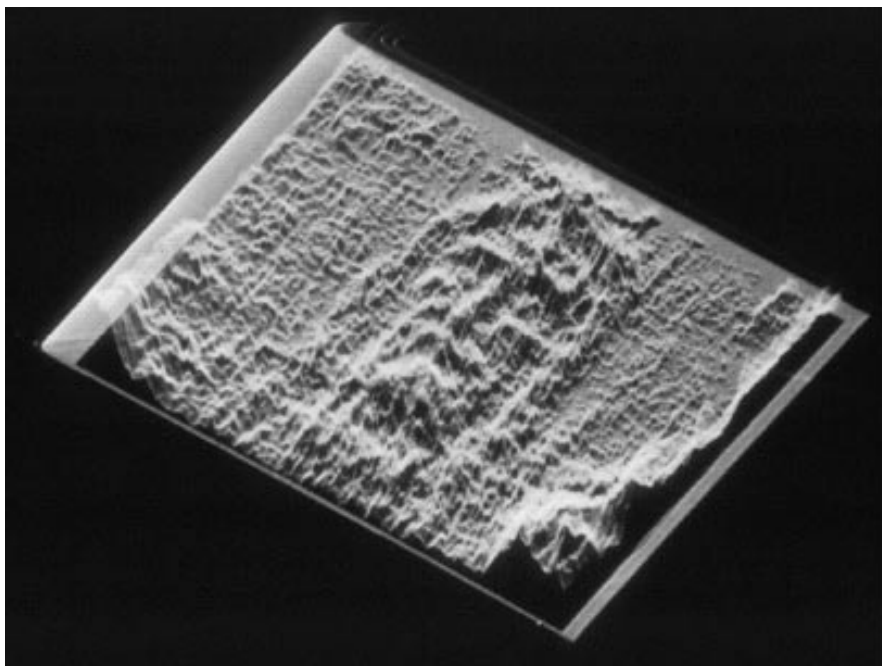
A view of how the Shroud was frequently displayed. Note how the corners would be stressed.



A rough sketch to show how the Shroud covered the body.



A distorted image of a photograph from the VP-8 Image Analyzer.



A image of the Shroud with 3-D information from the VP-8 Image Analyzer.

All images are from the Shroud of Turin Education Project Image Gallery (2005) and are used with express written permission.

Appendix 2

A Summary of STURP's Conclusions

No pigments, paints, dyes or stains have been found on the fibrils. X-ray, fluorescence and microchemistry on the fibrils preclude the possibility of paint being used as a method for creating the image. Ultra Violet and infrared evaluation confirm these studies. Computer image enhancement and analysis by a device known as a VP-8 image analyzer show that the image has unique, three-dimensional information encoded in it. Microchemical evaluation has indicated no evidence of any spices, oils, or any biochemicals known to be produced by the body in life or in death. It is clear that there has been a direct contact of the Shroud with a body, which explains certain features such as scourge marks, as well as the blood. However, while this type of contact might explain some of the features of the torso, it is totally incapable of explaining the image of the face with the high resolution that has been amply demonstrated by photography. The basic problem from a scientific point of view is that some explanations which might be tenable from a chemical point of view, are precluded by physics. Contrariwise, certain physical explanations which may be attractive are completely precluded by the chemistry. For an adequate explanation for the image of the Shroud, one must have an explanation which is scientifically sound, from a physical, chemical, biological and medical viewpoint. At the present, this type of solution does not appear to be obtainable by the best efforts of the members of the Shroud Team. Furthermore, experiments in physics and chemistry with old linen have failed to reproduce adequately the phenomenon presented by the Shroud of Turin. The scientific consensus is that the image was produced by something which resulted in oxidation, dehydration and conjugation of the polysaccharide structure of the microfibrils of the linen itself. Such changes can be duplicated in the laboratory by certain chemical and physical processes. A similar type of change in linen can be obtained by sulfuric acid or heat. However, there are no chemical or physical methods known which can account for the totality of the image, nor can any combination of physical, chemical, biological or medical circumstances explain the image adequately.

Thus, the answer to the question of how the image was produced or what produced the image remains, now, as it has in the past, a mystery.

We can conclude for now that the Shroud image is that of a real human form of a scourged, crucified man. It is not the product of an artist. The blood stains are composed of hemoglobin and also give a positive test for serum albumin. The image is an ongoing mystery and until further chemical studies are made, perhaps by this group of scientists, or perhaps by some scientists in the future, the problem remains unsolved. (Shroud of Turin, A Summary, 2007)

