

Shroud feature

## The Holy Shroud of Turin

### 1) Under the microscope - Some scientific studies of the Shroud

*By David Belz*

IN THE ROYAL CHAPEL OF THE CATHEDRAL OF SAINT JOHN THE BAPTIST IN TURIN, Italy, is a linen cloth measuring 4.34 metres long and 1.09 metres wide, preserved there since 1578, and occasionally displayed for public viewing and veneration. On the cloth are two faint brownish images, those of the back and front of a gaunt, sunken-eyed, man, as if a body had been laid lengthwise along one half of a shroud while the other half had been doubled over the head to cover the whole front of the body from face to feet.

Many Christians and others believe it to be the burial cloth of Jesus Christ, mentioned in the Gospel of John 20:3-7; a few knowledgeable enthusiasts claim it is a photograph of Christ's resurrection, while others look for a more natural explanation; some are more cautious, that it is no more than a pious depiction of the crucified Christ; sceptics dismiss it as a mediaeval forgery.

Its certain provenance is only known from about 1390, but it also seems likely that it was in the possession of a French knight Geoffrey de Charny who died at the Battle of Poitiers in 1356. There are grounds for believing that it may have been the Mandylion of Edessa, known since 525AD and which disappeared from Constantinople in 1204.

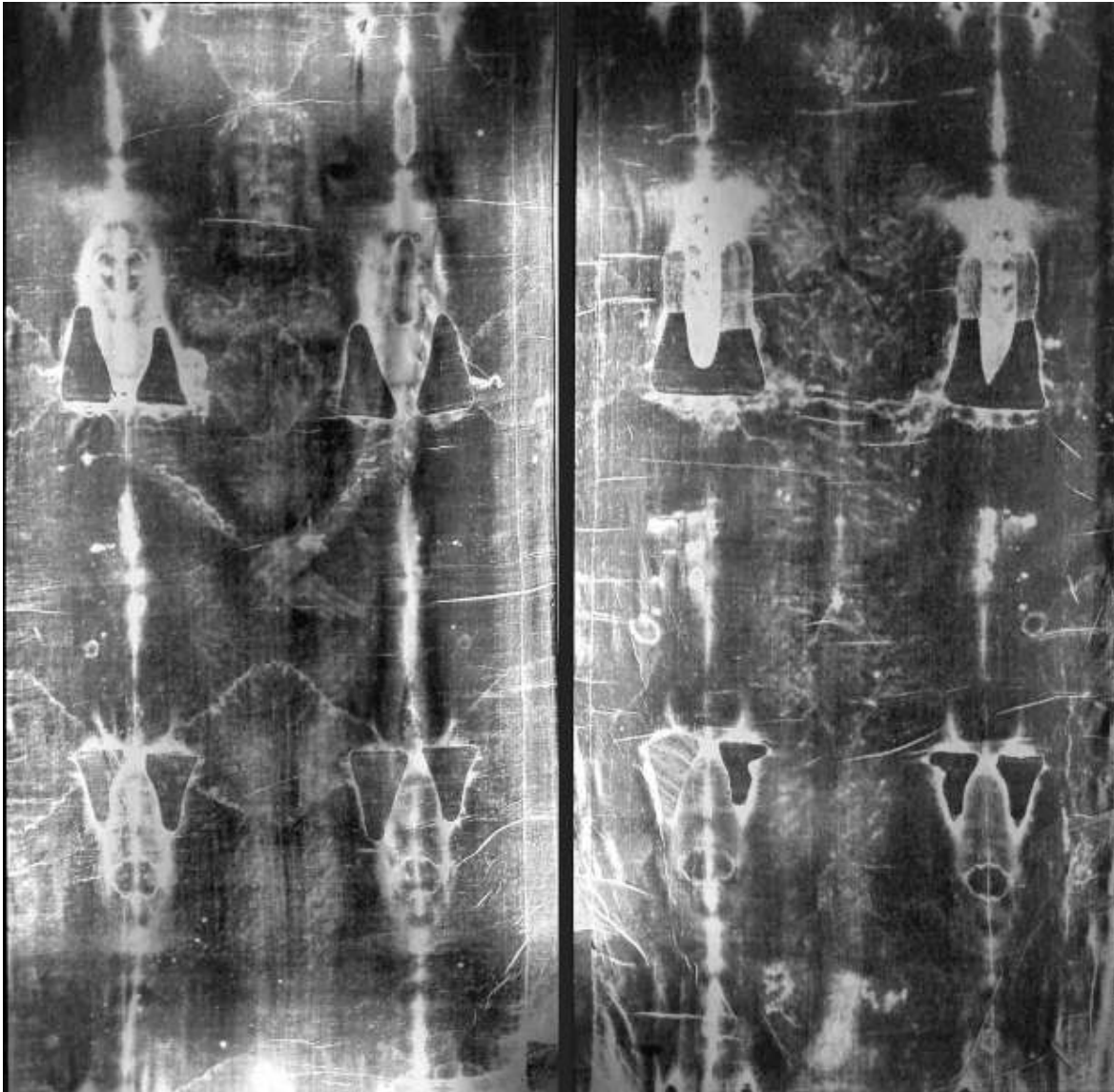
It is probably the one ancient artefact that has been subject to more scientific study than any other, but it remains an enigma, an unresolved controversial scientific puzzle. In this feature article I want to give an introduction to the topic and a summary of a few of these investigations. The history of the cloth is also enigmatic, but can be dealt with at some other time.

### The first photographs

Modern interest in the cloth dates from 1898 when Italian photographer Secondo Pia was permitted to photograph the cloth prior to a public exposition. To his astonishment, his glass negative, showed not a ghost of the shadowy figure on the cloth, but instead an unmistakable photographic likeness. It was as if the cloth itself had been a photographic negative, waiting until the discovery of photography could reveal its true nature by reversing the image and thus showing the true likeness of the man hidden on the cloth.

Even these early primitive photographs excited considerable scientific interest, notably in the Sorbonne, Paris, where a small team led by a young biologist Paul Vignon made a special study. The findings were first presented to the Paris Academy of Sciences in 1902 by Yves Delage, Sorbonne professor of comparative anatomy, well-known for his agnosticism and his aversion to the miraculous and supernatural. He entitled his paper "*The Image of Christ Visible on the Holy Shroud of Turin*".

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*Two negative images of the Shroud cloth, with frontal and dorsal images side by side, after Guiseppe Enrie 1931. The cloth itself seems to act as a negative so that a photographic negative prints out as a positive image. The eight symmetrically placed irregular shapes are patches sewn by the Poor Clare nuns to repair holes caused by molten silver after the 1532 fire in the Chambery chapel, when the cloth was folded.*

*The nail hole wound in the left wrist is clearly visible, and the white marks on the arms show the blood flows from the crucified position. The dorsal view shows numerous whip marks from the Roman flagra, while the white marks around the top of the head are blood flows, as if from a crown of thorns.*

Shroud feature *cont.*

Anatomy of the wound images

Yves Delage pointed out that from a medical point of view, the wounds were so anatomically flawless, that it seemed impossible that they could be the work of any artist, particularly if working in negative, and there was no trace of any known pigments anyway. He considered the Shroud image to be of Christ, created by some unknown process while he had lain in the tomb. The British Medical Journal, *The Lancet* considered Delage's findings well-reasoned and scientific, but the rationalists and free-thinkers dominating the Paris Academy refused to accept them, and Delage turned his interests to other fields.

The negative image was revealed even more clearly in 1931 when professional photographer Giuseppe Enrie took a new set of photographs under more favourable conditions than had been available to Pia in 1898.

The man on the cloth had obviously been crucified and the images of the wounds matched

those described in the gospel accounts. He had been whipped by two men from either side, using the Roman *flagra*, leaving some 90 to 120 small marks. There were numerous puncture marks on the head corresponding to a crown of thorns, his face had been badly bruised, his right side had been pierced as if by a typical Roman lance.

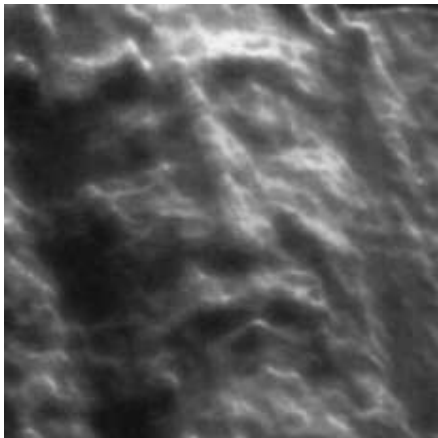
The feet had been fastened with a single nail piercing flesh only, with the left foot over the right, while the arms had been securely fastened by nails between the bones in the wrists. Extensive forensic tests by several medical men using cadavers and amputated limbs proved that the wounds behaved in the way to be expected, the direction of the blood flows being particularly convincing. The effect of wrist-nailing produces a reflex action on the thumb so that it becomes hidden by the palm, as shown on the cloth image.

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Overview of further studies

Investigations and research have continued, over the last 50 years. In 1969 a special scientific commission was permitted to examine it, and new photographs were taken in colour, black-and-white, and ultra-violet. In 1973, the Shroud was exhibited for TV and press purposes, and samples of surface matter were taken for analysis by Dr Max Frei, a criminologist from Zurich, who has worked on many important crimes and accidents.

In 1976 some remarkable 3-dimensional image analysis used in aerospace science showed that the light and dark portions of the Shroud image corresponded to the 3-D body contours not apparent in normal photography. The three scientists involved along with over thirty others then formed the Shroud of Turin Research Project STURP, which continues to conduct a wide range of studies on the Shroud.



*A remarkable aero-space VP8 Analyser image showing the 3-dimensional properties of a Shroud negative. The Analyser does not exhibit this 3-D property with ordinary photographs.*

### Under the microscope - Pollen & dirt samples

Dr Max Frei, a Zwinglian Protestant and far removed from Catholic leanings, was a botanist by training and took several samples using standard sticky tape methods. In his laboratory he immediately identified mineral particles, hairs and fibres from plants, spores from bacteria, mosses and fungi, and pollen grains from flowering plants which were of particular interest.

Pollen grains are virtually indestructible, and can be identified with certainty under the electron microscope. Frei hoped to identify the geographic regions the Shroud had passed through, although many species once unique to a specific area have now spread across the globe, having been planted in various parks and gardens. The famous cedar of Lebanon, although present and indicating a possible Palestine provenance, could not be considered specific as it is now planted throughout the Mediterranean.

The break-through came with his discovery of halophytes, salt-loving plants which are exclusive to the Dead Sea area in Palestine, and included desert varieties of *Tamarix*, *Suaeda*, and *Artemisia*. He considered that the pollen he collected included six species exclusive to Palestine, a "significant number" of plants from Turkey from the Anatolian steppes, and pollen from eight species of Mediterranean plants, consistent with the history of the Shroud in France and Italy.

Since Frei's work in the mid-1970's, other botanists have separately identified in 1985 and 1997 other pollen grains exclusive to Jerusalem, flowering only in March and April, the months of the Jewish Passover.

High resolution spectroscopy shows that dirt particles on the Shroud, travertine aragonite limestone, are identical with limestone samples from ancient Jerusalem tombs. These are mostly around the feet, suggesting road-dust acquired during walking.

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### Image Analysis

USAF scientist Dr Eric Jumper had become interested in the possible 3-D properties of the Shroud image as early as 1968 and enlisted the help of another USAF colleague, Dr John Jackson. With a third USAF officer as a model and draping a muslin cloth over his form, they were able to correlate image intensity with the model's cloth-to-body distances.

In 1976 at Albuquerque, Jackson was advised to consult Bill Mottern an image-enhancement specialist at Sandia Laboratories. Mottern inserted an ordinary transparency of the Shroud into his VP8 Image Analyser, a device which plots shades of brightness as vertical relief. Both men were amazed to see the Shroud figure on the screen monitor show up in perfect 3-dimensional relief. It was possible to rotate the image obtaining side views and also to show the back views including the pigtail as tightly gathered hair at the back of the neck in the fashion of early Jews.

The Analyser does not display this effect of 3-D imagery with ordinary photographs.



VP-8 of frontal body image

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They also observed strange bulges over the eyes, which appeared to be small coins, consistent with a Jewish burial practice cited in anthropology literature. However they were unable to satisfy themselves completely. Other workers have claimed to recognise lepton coins issued under Pontius Pilate, while yet others have challenged this aspect which remains inconclusive.

Electron microscopy shows that the Shroud image is only on the crowns of the outermost layers of the textile fibres, and has not penetrated the fibres as would any pigment. More

recent work indicates that the image seems confined to the natural starch and saccharide coating of the fibres, a depth of 200 nm (0.0002 mm).

In December 2011, after several years of attempting to replicate the image properties, an Italian science group ENEA led by Paolo Di Lazzaro, announced that they could only succeed in reproducing the coloration by very short bursts (50 ns) of ultra-violet laser light. Sceptics have dismissed this as irrelevant, as the image, being confined to the crowns of the fibres, is typical of a contact process, rather than a more dispersive radiation process.



*Entombment of Christ and Visit of Holy Women, scenes from Hungary's Pray manuscript, c. 1192. A Shroud-like figure is in the upper scene; the herring-bone twill is shown in the lower one; Triple burn-holes are indicated possibly from a "trial by fire", under Caliph Mu'awiyah about 679 AD, and reported by Bishop Arculf of Perigueux during his travels.*

**Shroud as a textile**

The linen cloth itself is a 3 in 1 herring bone twill, well within the capability of first century Syrian weavers, but this weave was usually reserved for silk, suggesting a costly manufacture befitting the wealthy Joseph of Arimathea. Some cotton contamination in the linen indicates that weaving had to be on looms of Middle East and not European origin. There is no wool, which would contravene Jewish Mishnah requirements of keeping kinds separated.

At some early stage, a partial side strip of matching linen of similar weave was added to the main cloth, as if to centralise the facial image. This is considered significant in the reconstruction of a suggested history of the cloth as the original Mandylion of Edessa, which disappeared from Constantinople in 1204 after the city had been sacked by Crusaders.

In 1532, a fire in the Chambery chapel badly damaged the Shroud which was found to have been holed and scorched by molten silver from its reliquary box. Poor Clare nuns sewed a backing piece of holland-cloth onto the Shroud and also patches over the most damaged areas. A new backing cloth and further repairs were carried out in 1694. Princess Clotilde of Savoy sewed a new red silk lining cloth in 1868.

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In 1997 the Shroud was again damaged by fire, possibly arson, and in 2002 the Holy See arranged for a complete restoration. Removal of the backing cloth enabled the reverse side to be scanned and photographed. A ghostly part-image of the body was found on the back of the Shroud in 2004.-----

In 1988, the Holy See permitted radiocarbon dating on portions of a swatch taken from a corner of the Shroud. Tests by the University of Oxford, the University of Arizona, and the Swiss Federal Institute of Technology all concluded that the sample dated to 1260-1390 AD with 95% confidence, which seemed to contradict all the other evidence.

While not impugning the Radiocarbon testing itself, several investigators severely criticised the method of sampling, as being the worst possible sample that could be taken. Criticisms included a high likelihood of contamination from mediaeval handling during fre-

quent exhibiting, the swatch not being properly representative of the whole, the reliance on a single sample, the likelihood that the piece tested came from a repair, and the possible effects of the 1532 fire. The chemistry of the sample, with its significant vanillin content is different from the main cloth which has no vanillin content, and indicates it was indeed a patch.

What ought to have been a conclusive test, has therefore only resulted in further contention about the cloth's authenticity, with supporters and sceptics equally divided, both holding entrenched opposing views.

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**Blood Grouping**

In a very recent posting, highly praised by devotees and sceptics alike, immunologist Kelly P Pearse, presented a detailed analysis of research on the red stains. These proved to be blood of Group AB, consistent with that on the Sudarium of Oviedo (believed to be the head cloth described in the gospel of John) and she dismissed claims that all old blood degenerates to AB.

Worldwide, the occurrence of AB is 5.1%, about 3% in Europe, and about 8% in the Middle East. The random probability that two blood-stained cloths would both be AB, is about 0.25%, giving quite a high likelihood that the two cloths are indeed associated.

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**Other Aspects**

There are several other aspects to the scientific investigations of the Shroud. There is no evidence of paint for example, and the image lacks any directionality, showing that the image could not have been produced by an artist. There is a very pure form of iron oxide present, believed to be a by-product of the retting process in extracting the linen fibre from the flax, or else as a residue from blood stains. Iron oxide from any mineral source used to produce the image would have had high levels of impurities.

The Oviedo head-cloth blood stains occurred while the victim was still alive, but there is still a close geometric match with the head stains on the Shroud. No corruption is evident on the

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**Shroud feature *concl.***

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Shroud image, so that it had to be formed within two days after death.

Various natural processes have been suggested as theories of image formation, including the action of post-mortem gases on the mixture of myrrh, aloes and burial spices, or the natural starches and saccharides on the cloth surface. However this remains inconclusive. One further mystery is the absence of any lateral image, suggesting that the cloth may not have been wrapped entirely around the body, if the image was caused by a natural process.

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**Conclusion**

I first became fascinated with the mystery of the Shroud of Turin in 1960, when our Dominican University chaplain gave a presentation to a group of us inherently sceptical engineering students. In 1978, Ian Wilson published his book "*The Turin Shroud*" which was probably the most definitive publicly accessible work on the topic to that time. I have used this as a part-reference for this article.

However as indicated in the text above, there have been many ongoing studies, investigations and developments since the publication of Wilson's book, including his 2010 update.

One common feature of the many sceptical criticisms has struck me: That critics of the Shroud only ever look at one aspect, without ever considering the total weight of evidence. Those who claim to have replicated the image by various means, can never seem to include all the crucial features that make the Shroud unique. They always seem to miss out on some critical aspect.

I think that is why I shall continue to be persuaded that it is the authentic burial cloth of Jesus, until I shall be proved wrong. How the image was formed, remains a mystery. The burden of proof remains in the sceptics' court. DTB

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**References**

- *The Turin Shroud*; Ian Wilson, Victor Gollancz, 1978; Several later works are also available;
- *The Shroud*; Ian Wilson, Bantam Press, 2010. An update of his 1978 book, including subsequent investigations and comments on the 1988 carbon-dating.
- *Wikipedia* has a comprehensive up-to-date web-page which gives coverage of the more important research work, and presents assorted points of view, both for and against; [http://en.wikipedia.org/wiki/Shroud\\_of\\_Turin](http://en.wikipedia.org/wiki/Shroud_of_Turin) ; I have this as a \*.mht file I can send readers by Email on request;
- Probably the best web-site, and most enduring is <http://www.shroud.com/index.htm>; Barrie M. Schwartz, Editor and Founder 1996, Published by the Shroud of Turin Education and Research Association, Inc. (STERA, Inc.)
- An excellent highly active Blog site is Dan Porter's <http://shroudofturin.wordpress.com/> . There is strong expert interaction between both Shroud supporters and sceptics, dealing with topical aspects.
- Stephen E Jones is an evangelical Christian at a Church of Christ in Perth. He has several religious web-sites with a particular point of view. However his Shroud Blog-site is generally excellent. You can find it at <http://theshroudofturin.blogspot.co.nz/>
- Unfortunately you can also find several hostile sites, replete with ill-informed comment and false information. There is a lot of deliberate ignorance out there!