

## Testing the Shroud and the Sudarium at the Molecular and Atomic Levels

by Mark Antonacci

I've had the pleasure of writing two books on the Shroud of Turin, *The Resurrection of the Shroud* in 2000 and *Test the Shroud* in 2015.<sup>1</sup> I'm also the president of Test the Shroud Foundation, which for decades has supported new and innovative scientific research pertaining to the Shroud of Turin. This foundation also currently supports and is affiliated with the Shroud Research Group that Bob Rucker will tell us about tomorrow morning.

Among our primary concerns is to support research at the molecular and atomic levels on linen, blood, watery fluids, limestone, and pollen on the Shroud of Turin and the Sudarium of Oviedo, along with the charred material and sewing threads from the Shroud. Neither of these cloths nor the various materials on them has ever been tested at these levels. Testing at the molecular level by hyperspectral and multispectral imaging would allow both entire cloths, all of the materials upon them, as well as all the materials that have already been removed from them, to be definitively identified as never before. One reason that such stunning identification can be made is that materials can now be scientifically examined in the infrared, visible, and ultraviolet spectrums *simultaneously*.

These new techniques would allow scientists to not only identify every *fiber* of every *thread*, but also what is *on or between* every fiber and thread on both cloths. This technology would allow the individual chemical or elemental compounds to be identified on both of these linen cloths, their blood marks, watery fluids, and other materials, and anything that is on these materials.

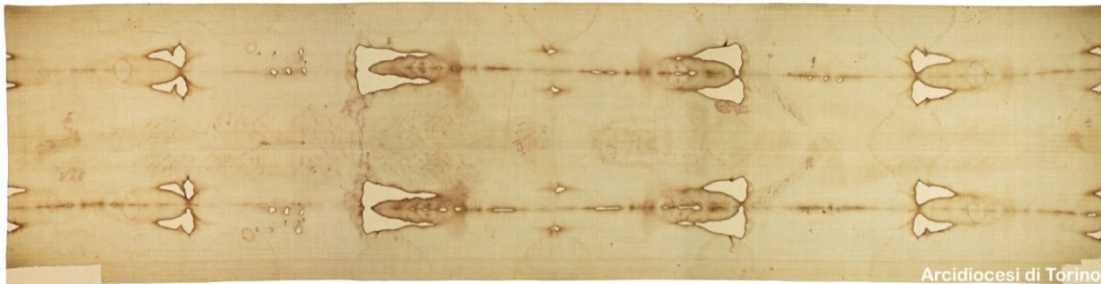
Of course, the Shroud is much larger than the Sudarium and contains greater quantities of these materials. The Shroud also contained an extensive amount of charred material that was removed in 2002 and is now kept in 42 vials in Turin, as seen below in Fig. 1.<sup>2</sup>



1. 42 small vials of charred material have been kept in Turin since they were removed from the Shroud in 2002.

These charred materials and any materials that were on them or vacuumed with them from the Shroud should be *initially* examined at the molecular level. In the extra session tomorrow, we will see how merely examining a *tiny part* of the charred materials at the atomic level could yield some of the most important information ever discovered from the Shroud.

The Shroud also has approximately 13 feet of sewing threads that run parallel with and about 3 inches from the edge of one long side of the Shroud, as seen below in Fig. 2.



**2.** *The line of sewing threads can be seen near the bottom of the horizontal Shroud.*

As seen in Figs. 3 and 4 below, this long seam has been carefully folded onto and sewn from the reverse side of the Shroud so it appears flat and hardly noticeable on the front side. This also causes the reverse side to have a raised or rolled effect that is noticeably similar to the hems of cloths found in the tombs of the Jewish fortress of Masada destroyed in 73 A.D.<sup>3</sup>



**Fig. 3 & 4** *The Shroud's seam has been folded onto and sewn from the reverse side so it appears flat and hardly noticeable on the front side.*

The part of the Shroud linen that is between the sewing threads and the long edge of the Shroud is called the side strip. Removing the backing cloth and examining both sides of the entire side strip and the main portion of the Shroud

linen at the molecular level could *definitively* tell whether the linen in the side strip came from the same bolt of fabric as the main part of the Shroud or is added material. (It would also inform scientists of the chemical composition of the sewing threads, thus allowing small portions of the abundant sewing threads to also be tested at the atomic level.)

Examining both sides of the Shroud and the side strip at the molecular level would also *definitively* tell us whether the Shroud was invisibly rewoven at or near the site that was radiocarbon dated in 1978. Photomicrographs, x-ray fluorescence, and radiographs of the Shroud from 1978, as well as visual inspections of both sides of the cloth at or near the radiocarbon site by many experts and observers in 2002, indicate that it was not rewoven at or near this location.<sup>4</sup>

Examining the Shroud at the molecular level could identify *any* natural or artificial products on the Shroud and whether they have effected or caused the cloth's unique full-length frontal and dorsal body images, its aberrant and unreliable carbon date, or effected the appearance or composition of the blood marks. In other words, every naturalistic and artistic hypothesis that attempts to explain the appearance, composition, and cause of the Shroud's body images, its blood marks, or its controversial carbon dating can be simultaneously tested by examining the entire cloth at the molecular level.

The Shroud's scorch marks, burn holes, and water stains could be similarly examined. Furthermore, *additional pollens and limestone* could also be located, especially on the *outer side* of the Shroud, which has never been examined for pollen or limestone. The outer side of the dorsal image would have lain directly on the limestone floor of the man's burial tomb.

Among other outstanding questions that molecular microscopy could shed new light on or definitively resolve are:

- whether the body images are comprised of oxidized, dehydrated cellulose;
- consisting of double-bonded carbon or oxygen atoms that were originally single-bonded together within the Shroud linen;
- whether some of the molecular bonds in the non-crystalline regions of the Shroud's cellulose have broken and reformed;

- the types of limestone or pollen or other material on the Shroud. (This technology could possibly add clarification to previous identifications of pollen species or genera on the Shroud.);
- whether there are two separate sets of water stains on the Shroud from two different events that occurred centuries apart.
- whether discoloration is found on the Shroud linen where coin features and flower parts have been identified.
- whether discoloration is found on the outer side of the cloth at the hands and face.

Examining the entire Shroud by hyper or multi-spectral imaging or other technology could also reveal what areas of the Shroud to avoid or concentrate on for future research. For example, parts of the cloth containing starch or wax or other foreign materials that could chemically bind to the cellulose, not be detected with the naked eye, and not be removed by standard pretreatment cleaning processes might be avoided. In the same vein, parts of the cloth containing critical indigenous elements such as calcium, chlorine or nitrogen could be revealed and provide special areas of concentration.

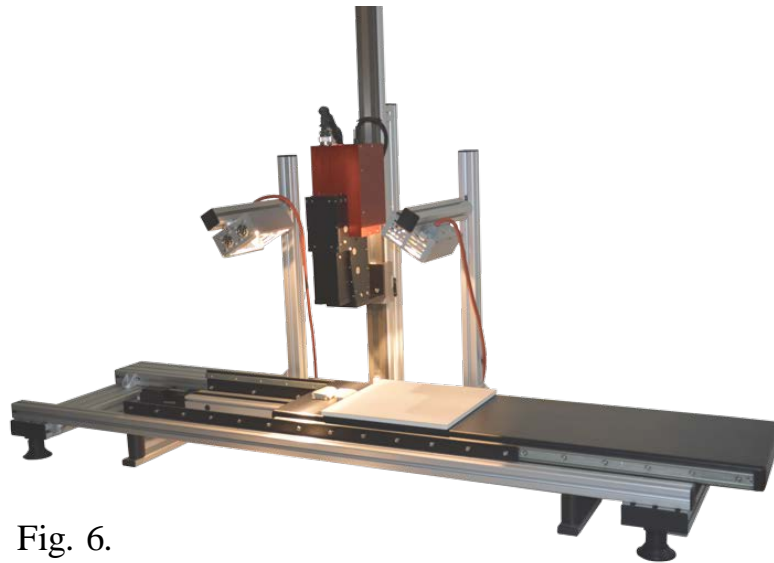
The above findings merely comprise the primary or initial things to look for by examining the Shroud at the molecular or other very intricate or superficial levels. This technology could *non-destructively* scan the entire Shroud in a matter of hours and provide so much information that it could take years for scientists to collate and analyze all of its data. It could provide many many times more information than has been acquired since 1898, when scientific technology was first applied to the Shroud.

I last wrote at length about molecular microscopy in *Test the Shroud* (St. Louis, Forefront Publishing Co., 2015) in 2015, when multi-spectral imaging viewed through a desk-top size FTIR microscope (in Fig. 5 below) was the best available equipment that I was aware of.



**Fig. 5** Cary 620 FTIR microscope and imaging system.

However, it would have been quite difficult to examine a cloth 14' 3" long and over 3 ½' wide (4.34 m x 1.10 m) with such a small viewing mechanism as found with the FTIR microscope above. This problem has now been completely resolved with a version of hyper-spectral imaging seen in Fig. 6 below.



**Fig. 6.**

Hand held devices are also available to gather information from large objects like the Shroud.

Hyper and multi-spectral imaging and similar techniques could acquire such detailed and multiple amounts of information at the molecular and other levels of the blood and watery fluids on *both* the Shroud and the Sudarium as to constitute a

virtual “fingerprint” of the man’s vital fluids. This detailed information from such chemically-rich bodily fluids could even scientifically indicate whether the blood and watery fluids on these cloths were from the same individual!

Irradiating control linen with a variety of low-energy radiation and comparing their findings at the molecular and other sensitive levels, both *before and after* they have been artificially aged, to those from the Shroud, could also indicate if the Shroud was irradiated with radiation. One or a combination of these low-energy forms of radiation could have effected or caused the Shroud’s unique body images, the appearance of the blood marks, and the Shroud’s aberrant radiocarbon dating.

More importantly, examining the Shroud and the Sudarium at the atomic level could definitively prove whether these cloths, their blood, watery fluids, and other materials upon them were irradiated with a unique form of radiation that was not even discovered until the 20<sup>th</sup> century. Although this form of radiation would not have caused the Shroud’s body images, it could explain the still-red color of the Shroud’s blood and *easily* explain the unreliable and controversial carbon dating results. In the extra session, Bob Rucker and I will discuss how testing the Shroud (and other materials that were originally on it) by this minimally invasive technique could prove with *billions of unforgable* items of evidence that radiation miraculously emanated from the multiply-wounded, crucified corpse wrapped within this cloth, the amount of radiation that was received at each location, when this unprecedented radiating event occurred, where it happened, and the identity of this individual.

I’m not against applying more advanced testing methods to the Shroud’s blood in the future to confirm earlier consistent findings that it was human blood. New testing procedures can now more definitively confirm that the blood is from a human being as opposed to a primate.<sup>5</sup> Yet, the vast majority of the Shroud’s 150 or more blood marks either formed directly at the site of the wounds (i.e. the 100 or so scourge marks) or flowed from them, and the bodily features, reactions, and full-length images are clearly those of a human man and not those of a primate. Moreover, testing the Shroud’s blood at the atomic level could more definitely determine whether neutrons radiated from a multiply-wounded, crucified corpse wrapped in the Shroud, the age of the blood, when this miraculous radiating event occurred, where it happened, and the identity of the victim, than all other forms of laboratory testing. The necessarily limited amount of blood that might be removed from the Shroud and tested at a laboratory, should first (or also) be applied toward testing it at the atomic level.

After examining two blood samples taken from the Shroud at the back of the head, Dr. Victor Tryon of the University of Texas found human DNA with both X and Y chromosomes present in the samples, confirming that the Shroud's blood came from a human male. In addition, he found that the DNA was very degraded, which is consistent with ancient DNA.<sup>6</sup> Current scientific consensus requires at least 12 different blood samples from various areas on the cloth to confirm that the DNA belongs to the man wrapped in the Shroud. This is likely due to the fact that many people throughout the centuries have handled the Shroud—as caretakers, or for exhibitions, or repairs, or examinations through 2002. Well over fifty different artists have also been documented to have sanctified their paintings by laying them on the Shroud. Anyone who has handled the Shroud could have left his or her DNA on it.

However, even if a dozen different samples could be acquired containing X and Y chromosomes, they would comprise only minor additional parts of an entire body of medical, anatomical, chemical, archaeological, historical and visual evidence to indicate the cloth wrapped a multiply-wounded, crucified man. This would not justify removal of 12 blood samples from different areas of the Shroud for DNA analysis when far fewer samples can be utilized for testing at the atomic level. Moreover, testing a few blood samples at the atomic level could definitively prove that a unique radiating event occurred *from* this man's dead body after he was buried in this linen shroud according to detailed Jewish burial customs, under *all* the same circumstances and limitations of time, place, executioners, instruments, buriers and burial customs as existed with Jesus. While this miraculous radiating event could have originated from the man's dead body and encoded his full-length frontal and dorsal body images and blood marks, this event would necessarily have happened only after this man incurred a series of premortem and postmortem wounds and blood flows and was wrapped in his burial shroud. Since atomic testing could prove with billions of items of unforgeable evidence the occurrence of a miraculous event on several levels and confirm the prior series of premortem or postmortem events, under all of the above circumstances, the identity of the man would be established with more certainty than DNA evidence can presently establish for contemporary events with contemporary people.

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