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Can Contamination Be Detected on the Turin Shroud to Explain Its 1988 Dating?

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Abstract

This paper proposes future testing that could examine every fiber on the Shroud of Turin. It also proposes specific tests for the presence of neutron-created C-14, Cl-36 and Ca-41 on control samples and on linen, blood, charred material and limestone from the Shroud of Turin and/or Jesus' reputed burial tombs. These tests could refute the Shroud's 1988 radiocarbon dating and establish its actual age. The proposed tests could also demonstrate that the Shroud linen and its blood was irradiated with a neutron flux and indicate when and where the event took place.

Keywords: Turin Shroud, radiocarbon, neutrons, chlorine-36, calcium-41.

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1 INTRODUCTION

Perhaps, the most important dichotomy in all of history is before us and the world. Extensive scientific tests and experiments for the last four decades, along with a wealth of medical, archaeological and historical examinations throughout the 20th and 21st centuries have yielded a wide array of objective, independent and corroborating evidence that the Shroud of Turin wrapped a dead human male who had intimate contact with this burial cloth. This man had been beaten about the head and face. He was scourged throughout his body with a Roman flagrum and crowned with a bundle of sharp pointed objects or thorns. He had broad excoriated areas across the back of his shoulders, endured falls and was crucified. After dying in the vertical position, he was pierced in the side by a Roman lancea causing blood and watery fluid to flow from the wound. Afterward his body was wrapped in a linen shroud and buried according to detailed Jewish burial customs in the same rock shelf in which Jesus was reputed to have been buried. All of these events appear to have occurred in Jerusalem in the spring of the first century. However, within two to three days of having been wrapped in the Shroud, the body left the cloth in a mysterious manner.

An unprecedented event occurred to this body prior to or during its disappearance that caused the man's full-length frontal and dorsal body images and 130 blood marks (along with several secondary features) to be encoded on this burial shroud. The full-length body images and blood marks are so unique they have never been duplicated in any age by any artist, scientist, physician or anyone utilizing any type of artistic, naturalistic or other method. While the most sophisticated science of today has been unable to duplicate the Shroud's body images and blood marks, it has discovered and revealed scores of unique features throughout the cloth that have never been seen before. These features not only appear impossible to forge or occur naturally, but seemingly defy the laws of chemistry and physics.

2. BACKGROUND

Of the thousands of scientific tests that have been performed on the Shroud only one result is inconsistent with its authenticity as the burial garment of the historical Jesus Christ and that is its medieval radiocarbon dating of 1988. This date was ascribed by and based on data from three laboratories following an arduous and controversial eight year process, whose result has been questioned by many on a variety of grounds.

Among the problematic challengers, Dr. Leoncio Garza-Valdès has asserted that the Shroud itself contains an invisible clear bioplastic coating of bacteria and/or fungi that contaminated the cloth and altered its dating. [1] Three problematic invisible repair hypotheses have also been offered to explain the cloth's dating. [2, 3, 4, 5]

A decade ago, The Resurrection of the Shroud Foundation commissioned a study by Dr. James Chickos, the head of the Chemistry Department at the University of Missouri, St. Louis, who found that tallow, which candle wax is made from, can become chemically bound to cellulose by a process known as transterification. [6] Wax has been identified on samples removed from the Shroud by STURP scientists John Heller and Alan Adler, and also by Walter McCrone. [7] Wax can also be seen with the naked eye in places on the Shroud itself, see fig. 1.

The sample from which Dr. Adler positively identified wax came from the edge of one of the relatively small, round holes found in a pattern and first observed in a painting of the Shroud in 1516.

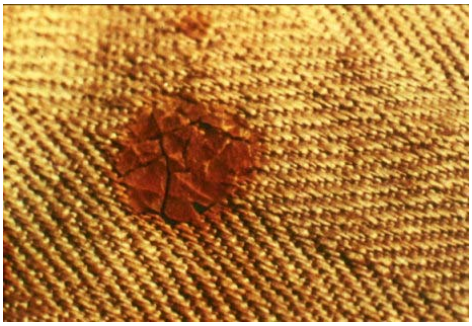

Figure 1. Wax on the Turin Shroud.

Wax is an excellent substance with which to stiffen cloth in order to give it strength and support. This would help keep the cloth from fraying or tearing at the edges of these burn holes, and could very well have been applied intentionally.

Of all the locations on the entire Shroud cloth from which to choose a sample for carbon dating, perhaps a worse location could not have been selected than the one chosen in 1988. Many of the reasons why were not known to those participating in the sampling nor apparent to the naked eye. For instance, starch was found on a thread from the Raes sample that is located immediately adjacent to the radiocarbon site. Starch could have been used to stiffen cloth and aid in any of the known repairs in this area. In 1982, without permission from the cloth's custodians or knowledge at the time that the thread contained starch, STURP sent a thread from the Raes sample to be radiocarbon dated. Interestingly, one end of the thread dated to A.D. 200 while the opposite end — containing starch — dated to A.D. 1000. [8] The molecular structure of starch is very similar to that of cellulose. Like wax, it, too, could chemically bind to cellulose, not be detected with the naked eye, and not be removed by the standard pretreatment processes. It could also alter the thread's radiocarbon date by many centuries.

This test was performed at a nuclear accelerator facility using a linear accelerator mass spectrometer technique, which was one of the methods developed for dating small samples. This was not a dedicated laboratory that regularly carbon dated samples, but the results from both ends are worth noting. If one end of the Shroud thread dated to A.D. 200, the error range of the dating could place the Shroud in the first century A.D. The presence of starch could possibly explain why the other end of the thread dated to A.D. 1000. Since starch was located near the 1988 Shroud radiocarbon sample site, this and all future sampling locations on the Shroud should be investigated.

3. PROPOSED TESTS

One of the best ways to test these various hypotheses is to perform imaging spectroscopy on the Shroud with a multi spectral camera. The application of this technology to the Shroud was advocated by Dr. Warren Grundfest in 1998, [9] and is similar to a proposal by Dr. Giulio Fanti in 1997 to take multi-spectral pictures of the Shroud.

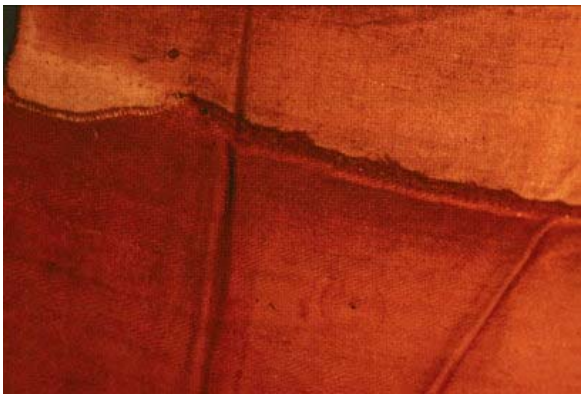

Figure 2. The light triangular area depicts the former location of the Raes sample on the Shroud. To its right is the location from which the radiocarbon samples were removed.

When the human eye sees an object, it perceives only the colors of the visible spectrum from red to violet. Below red lies the infrared part of the spectrum. Every chemical compound has a unique infrared spectrum, and this characteristic is routinely used to determine the chemical composition of unknown materials. Previously, one of two procedures was used to obtain spectral information from an object: either obtaining a complete spectrum of only one point on the object and repeating for all points of interest, or obtaining a complete image of the object at only one wavelength in the spectrum and repeating for all spectral wavelengths of interest. However, with this new technique, an object can now be viewed under the entire visible and infrared light spectra simultaneously, allowing its composite image to become visible from all spectra simultaneously. Items such as the vessels in a retina, the hemoglobin bands in the eye, and the spectral patterns of human chromosomes are routinely viewed and examined with this new spectral-imaging technique.

This new technology could scan the entire Shroud in only six hours, thereby allowing scientists to spend years analyzing all of its data. It could map the entire cloth and its samples, and identify not just every fiber of every thread, but what is on every fiber. It can even identify tissue at the molecular level. By using carefully calibrated light sources, the pattern of reflected light can identify individual chemical compounds on the Shroud. This type of detailed imaging of the entire cloth could demonstrate or refute any of the above hypotheses and allow us to learn much more about the Shroud.

This technology may also allow us to view whether chemical bonds in the cellulose have been broken or whether conjugated carbonyls (double-bonded carbons) are more prevalent on the body images than the rest of the cloth. This is very important for if radiation caused the

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Shroud's body images, it would break the cloth's single-bonded carbon, hydrogen and oxygen bonds allowing its broken carbon bonds to conjugate or double bind to each other. Imaging spectroscopy technology might also reveal whether non-body image encoding is present over either eye of the man in the Shroud and whether plant images could be on the cloth.

Similarly, this technique could allow us to view whether substances such as wax or starch had attached themselves to the molecular structure of the cellulose. As we saw, both contaminants are known to be on the Shroud with starch present, yet invisible, immediately next to the radiocarbon site. While the application of this technique on remaining samples at each of the carbon dating laboratories or from or near the radiocarbon site would not necessarily tell us whether these contaminants were present on the samples that were dated and destroyed, their presence would strongly indicate and confirm that these substances did chemically bind to the molecular structure at the radiocarbon site. The application of this nondestructive technique on the rest of the cloth could also tell us what other locations may have such foreign substances physically or chemically attached to the linen, and, thus, what area to avoid.

Imaging spectroscopy technology should also be attempted on each sample that has been or will be removed from the Shroud. This technology should also be applied to the back surface of the Shroud behind the facial and hand regions of the frontal image. Images at these locations were identified by computer enhancement of the back side of the Shroud after its 16th century backing cloth was removed in 2002 [10]. Cloth discolorations at these locations on the back side of the Shroud are possible with the two radiant cloth-collapse image forming methods involving ultraviolet and particle radiation, as well as a corona discharge method. Only these radiant hypotheses have accounted for these features. If broken chemical bonds or conjugated carbonyls are more prevalent at these locations on the back side of the cloth, this could confirm the presence of radiation at the time of image formation.

Recently Dr. Bruno Barberis, director of the International Centre of Sindonology in Turin, stated in a BBC report that the Centre plans to produce an accurate map of the Shroud to determine whether it is one cloth or contains repairs [11]. This would be an excellent opportunity to perform imaging spectroscopy with a multi-spectral camera on the entire Shroud, which would not only definitively answer the repair and other hypotheses, but provide an unprecedented wealth of information from the entire cloth, whose data could be analyzed by scientists for years. Now that the 1534 backing cloth has been removed, it would also be an excellent opportunity to examine both sides of the Shroud for limestone analysis and conduct X-ray fluorescence on the entire cloth. The 1534 backing cloth should also be extensively examined for the presence of limestone.

Dr. Barberis also recently stated that once the mapping of the cloth has been completed that another carbon dating would be considered [12]. Such a test would be premature and should not take place before other recommended tests are complete that could not only refute the Shroud's 1988 radiocarbon dating, but allow the cloth's true accurate age to be determined with the same accuracy as radiocarbon dating. These new tests could also demonstrate how this erroneous date occurred and explain the differing, inconsistent, internal data from the 1988 dating.

4. DISCUSSION

Three years of dramatic, critical tests and experiments have just been completed that can easily explain the 1300 year aberration in the Shroud's radiocarbon date. These tests involve irradiating linen with a neutron flux, one of the key components of particle radiation. As previously indicated, there is extensive evidence that radiation caused the images on the Shroud and that the source of this radiation was necessarily the dead, tortured and crucified body wrapped in the Shroud. [13, 14] There's not only extensive evidence indicating the radiation was particle radiation, but particle radiation emanating from this body will explain numerous things that no other image forming method begins or even attempts to explain. This method, called the Historically Consistent Method, accounts for all primary and secondary body image features; the more than 130 coagulated, unbroken and unsmeared blood marks that are still red and were embedded into the cloth in the same shape and form as when they flowed and coagulated on the entire body; the man's skeletal and dental features; the discoloring identified on the back side of the Shroud; the possible coin and flower images; the excellent condition of the cloth; as well as several resurrection-related or post-resurrection events that have never been explained before. No other method remotely begins to account for all of these features or events, or even attempts to [14, 15].

Experimental results presented at this conference demonstrate the well-known scientific principle that if linen, or any other nitrogen containing object, is irradiated with neutrons that carbon 14 (C-14) will be created within the irradiated linen. [16] These new C-14 isotopes are converted from nitrogen (N-14) within the molecular structures of the irradiated objects by the process illustrated in fig. 2.

These results demonstrate that the C-14 created from nitrogen in the air within or surrounding the linen fibers will disappear by natural aging in approximately six years. The new C-14 isotopes created from nitrogen within air will also disappear by the application of heat and by stringent standard pretreatment cleaning processes [16].

When carbon dating labs "date" an object they first apply standard stringent pretreatment cleaning techniques to the

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sample to eliminate any extraneous C-14 that is not native to the sample itself. Only then do they count the number of C-14 isotopes and compare them to the sample's carbon 12 (C-12) isotopes. From this ratio a date is ascribed to the sample. Inherent within this ratio and date is a critical assumption that all the extraneous C-14 was removed from the sample, and that only its indigenous C-14 was counted. If extraneous C-14 isotopes remained in the sample, they would alter its ratio and cause its corresponding radiocarbon age to appear much younger (or older) than its actual age.

Figure 2. Before collision of neutron (black) with nitrogen-14 nucleus, 7 protons (red) and 7 neutrons. After collision, neutron is captured and proton is ejected, resulting in carbon-14 with 6 protons and 8 neutrons.

Unlike C-14 created by neutrons from nitrogen in air, as well as other sources of extraneous C-14, the C-14 created by neutrons from N-14 that is part of or indigenous to the linen itself remains within the molecular structure of the linen. These experiments show that these newly-created C-14 isotopes remain despite natural aging, the application of heat at temperatures that the Shroud was exposed to during the fire of 1532, or when pretreated and cleaned by all seven standard pretreatment methods that were applied to the Shroud's cloth samples in 1988. These tests and experiments even demonstrate that combinations of natural aging, as well as the above applications of heat and the above standard pretreatment cleanings, will not remove the C-14 created by particle radiation from the indigenous N-14 within linen [16]. These experiments demonstrate that a neutron flux within particle radiation could easily account for the Shroud's 1300 year aberration.

In an influential study from 1999, statistician Dr. Bryan Walsh applied a series of statistical evaluations to the 1988 radiocarbon data that led to the conclusion that the Shroud subsamples each contained differing or non-homogeneous levels of C-14 that were directly related to the physical location of the samples [17].

Dr. Marco Riani gave the results of an extremely robust statistical analysis of hundreds of thousands of combinations and configurations from the limited published data of the Shroud's 1988 radiocarbon dating report [18]. This study not only rejects the report's conclusion that the dates are homogeneous, but clearly suggests the presence of an important contamination in the 1988 radiocarbon samples removed from the Shroud of Turin.

In an article published on Shroud.com, Dr. Remi Van Haelst confirms the non-homogeneity of the Shroud's C-14 samples [19].

Dr. Walsh also reported his statistical evaluations techniques demonstrated statistically significant differences in the mean values computed and the error terms reported by the three labs that radiocarbon dated the Shroud in 1988. He reports that the labs inadvertently masked significant underlying differences in the data [20].

Dr. Van Haelst reports that recalculations were undertaken by the labs and the British Museum to minimize the range of dates, mean values and error terms found in their unreported raw data.

Dr. Riani's report strongly suggests that the data from Arizona's second Shroud sample was eliminated from the British Museum's and the laboratories' calculations or recalculations.

According to the scientific protocols that the radiocarbon labs agreed to, the labs were also supposed to report their raw data to Italian analyzing institutions and the British Museum before a date was assigned to the Shroud; however, this data was reported only to the British Museum. Even with the minimized reporting undertaken in 1988, the radiocarbon dates varied more than two hundred years over a distance of only 5 centimeters. According to Walsh's statistical evaluations, the subsamples given to Oxford, Zurich and Tucson "each contained differing levels of 14C" [21].

While conducting the above research to explain the 1300 year aberration between the Shroud's 1988 radiocarbon date and its other extensive evidence indicating a first century origin, Dr. Lind and his colleagues may also have found the explanation for the inconsistencies and aberrations in the Nature report pointed out by Walsh, Van Haelst, Riani and others.

The answer lies in the varying amount of nitrogen indigenous to the linen. Unsurprisingly, since the nitrogen content within the molecular structure of woven linen is acquired from the soil and remains in the interior part of the flax plant after the retting and hulking (beating) processes prior to weaving the cloth, its content will not be consistently level throughout the cloth or from location to location.

This has never been a problem when radiocarbon dating linen or any other objects containing nitrogen. This will only be a problem if the linen or object has been irradiated with a neutron flux at any time in its history. Then it is a problem that cannot be resolved because if a linen cloth or other object has been irradiated by a neutron flux, the additional C-14 created from its indigenous nitrogen cannot be removed by aging, the application of heat and/or standard pretreatment cleanings as incurred or received by the Shroud. While scientific tests could readily indicate the various amounts of nitrogen on the Shroud, that is the least of information that can be

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acquired from our proposed tests and experiments.

5. FURTHER PROPOSED TESTS / DISCUSSION

Scientific tests could be conducted on the Shroud of Turin or its samples that could completely refute the Shroud's 1988 radiocarbon dating by proving conclusively the Shroud was irradiated with particle radiation, the amount of radiation, and the actual age of the cloth and its blood. Scientific tests could even prove where such an unprecedented event occurred while this dead body was wrapped within the Shroud.

The neutron flux within particle radiation causes two other reactions to occur that are of tremendous importance and are known to science, but have never been tested before in connection with the Shroud of Turin. Since linen, blood, charred materials and limestone samples have all been removed from the Shroud during previous examinations these materials could be tested for such reactions. Particle radiation will leave unique amounts of isotopes within the molecular structures of objects, including the Shroud and its various samples — that cannot possibly exist or occur in any other manner. Two new chemical isotopes that virtually do not exist in nature, calcium 41 (Ca-41) and chlorine 36 (Cl-36), will be created in objects containing calcium or chlorine, but only if the objects have been irradiated by particle radiation. These new chemical isotopes occur because the neutron flux within particle radiation converts a limited number of Ca-40 and Cl-35 isotopes (the principle elements of calcium and chlorine) into Ca-41 and Cl-36 as seen in figures 3 and 4.

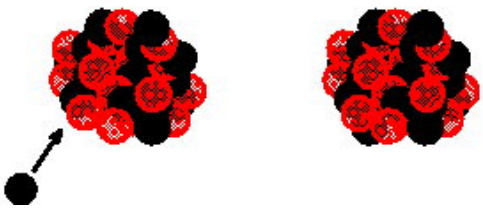

Figure 3. Before collision of neutron (black) with chlorine-35 nucleus, 17 protons (red) and 18 neutrons. After collision, neutron is captured, resulting in chlorine-36 with 17 protons and 19 neutrons.

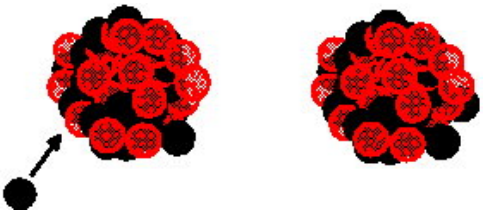

Figure 4. Before collision of neutron (black) with calcium-40 nucleus, 20 protons (red) and 20 neutrons. After collision, neutron is captured, resulting in calcium-41 with 20 protons and 21 neutrons.

Calcium has been identified throughout the Shroud linen cloth [22] and is known to naturally exist in blood, pollens and limestone. Calcium would also remain in charred samples removed from the Shroud [23]. Chlorine also occurs naturally in blood, pollen and limestone and should also be present on the Shroud linen [24]. If Ca-41 or Cl-36 were detected in any of these objects above their naturally negligible limits, their presence at such levels would prove these objects were irradiated by neutron particles, an event that could not possibly have occurred before the 20th century and could not possibly have occurred naturally.

Like the creation of C-14 isotopes by neutron radiation, the chemical isotopes, Cl-36 and Ca-41, are also created at established rates known to science. Like C-14, the quantities of Cl-36 and Ca-41 can be predicted from the amount of neutron radiation. If Shroud samples contain either of these two new chemical isotopes, scientists can calculate the amount of neutron radiation that each of the various samples received. Moreover, if the Shroud was irradiated by a neutron flux, scientists could calculate the age of its irradiated samples with the same accuracy as radiocarbon dating. For example, from the amount of neutron flux determined to have irradiated the Shroud's linen sample, scientists can calculate the amount of extraneous C-14 isotopes created and remaining within them following their standard stringent pretreatment cleanings. When this amount of C-14 isotopes is subtracted from the number within the C-14 to C-12 ratio from 1988 — the true age of the Shroud linen could be accurately determined — with the same accuracy as radiocarbon dating. In the case of the Shroud of Turin, it could be with far more accuracy than its radiocarbon dating of 1988.

Only the Shroud cloth was radiocarbon dated in 1988. We propose to also carbon date the Shroud's blood. Because blood has much more nitrogen within it than linen, if the Shroud's blood was irradiated by a neutron flux, it would not "date" to the Middle Ages, as the Shroud linen did in 1988 — it would date thousands of years into the future. This result alone would also refute the cloth's 1988 medieval radiocarbon date; however, so would many other of our proposed test results.

Chromium 53 (Cr-53), an isotope that exists in nature but not in blood, would also be created by conversion from Iron 56 (Fe-56) in predictable amounts in neutron irradiated blood. By measuring the Cl-35 to Cl-36, Ca-40 to Ca-41, and Fe-56 to Cr-53 ratios in neutron irradiated control and Shroud blood samples, we can determine with even more corroboration, the amount of neutron flux the particular Shroud blood samples received. From such tests on control blood samples, scientists can determine the amount of extraneous C-14 created and remaining within control and Shroud blood samples. This process would allow scientists to determine only the indigenous C-14 isotopes within the Shroud's blood samples — and to arrive at their actual age. The indigenous C-14 to C-12

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ratios in the Shroud's cloth and blood could yield first century dates. Similar Ca-40 to Ca-41 and C-14 to C-12 measurements, ratios, age and event calculations can also be performed on control and Shroud charred cloth and limestone samples, which could also yield first century dates. (Pollens are probably too light and insubstantial to adequately measure the Cl-36 or Ca-41 isotopes within them.)

Several of the scientists who participated in the Shroud's 1988 carbon dating subsequently acknowledged that if the cloth had been exposed to a neutron flux, such an event would invalidate the radiocarbon date which they assigned to it [25]. Proof that the Shroud was irradiated with just a minimal amount of neutron flux alone would invalidate the cloth's 1988 carbon dating.

Among the faint secondary images possibly discerned on the Shroud are features of a Pontius Pilate lepton (coin) over the man's right eye that was minted in the years 29-32 A.D., and various flowers that collectively grow only in the vicinity of Jerusalem, placed around the sides of the body. Particle radiation emanating from the length, width and depth of the dead body wrapped in the Shroud not only accounts for the Shroud's primary and secondary full-length body images, but also its possible faint coin and flower images. [13, 14] Coins and flowers in contact with linen cloth should be neutron irradiated in control tests to determine if their faint images appear on the cloth. Neither the Shroud's full-length body images nor its coin and flower images have ever been accounted for, let alone duplicated, by any artistic or naturalistic methods. If such experiments duplicate the Shroud's coin features, they will indicate that the radiating event occurred some time after the years 29-32 A.D., which is far more specific than the +/- range of accuracy for a radiocarbon date (approx. 150 years).

Duplicating the flower images would also help confirm the events occurred in Jerusalem; however, our proposed tests and experiments could even determine the precise location of this radiating event. There is a real chance that Jesus' burial tomb still survives in one of three possible locations within Jerusalem. Fortunately, all of these locations are contained within the same limestone rock shelf. Limestone has been found within the threads of the Shroud that match this same rock shelf, but does not match samples from other tombs in Israel [26]. The most likely tomb in which Jesus was buried has been enclosed by marble since 325 A.D. and is located within the Holy Sepulchre. Limestone samples from this tomb, as well as samples from the other possible locations of Jesus' burial tombs should be obtained. Since limestone is mainly comprised of calcium with trace amounts of chlorine and nitrogen, these samples should be examined for Ca-40 to Ca-41, Cl-35 to Cl-36 and C-14 to C-12 ratios.

No limestone rock shelf in the world contains C-14 isotopes. Since these rock shelves were formed millions or billions of years ago, all of their indigenous radioactive C-14 isotopes long ago disappeared at predictable rates. (Although unlikely, there could be enough trace N-14 and C-13 within limestone to convert to detectable levels of C-14 from a neutron flux.) Since Ca-41 virtually does not exist in nature, no limestone rock shelf in the world could contain this isotope above naturally negligible limits. Such presence within can only be created by neutron radiation. To have created detectable C-14 or the above levels of Ca-41 or Cl-36 in the molecular structures of the limestone within the marble enclosed tomb inside the Holy Sepulchre (or any other tomb within or nearby), would have required the construction of a neutron generator over the Holy Sepulchre.

Since C-14, Cl-36 and Ca-41 are produced and decay at predictable rates, if any of these isotopes are detected above their naturally negligible limits, scientists could calculate the amount of neutron flux received within the limestone tomb and when the unparalleled event occurred. Such presence of any of these unfakable isotopes within specific limestone walls would also strongly indicate the actual extant burial tomb of the historical Jesus Christ.

If these scientific measurements and calculations corroborate previous ones from Shroud cloth, blood and charred material, it would mean that several new scientific test results from several different materials would provide evidence of a miraculous radiating event. The results for three different isotopes from four sets of materials would not only refute the Shroud's 1988 radiocarbon dating, but could scientifically date the cloth and/or its radiating event to the first century.

Before any of these tests are undertaken on Shroud samples or samples from Jesus' reputed burial tombs, they should all be performed on control samples first. All of these vital and critical tests are destructive so extensive tests on control linen, blood, charred linen, and limestone should be undertaken first in order to learn the factors that could affect obtaining the most accurate results from Shroud samples. A good example of unexpected results on neutron irradiated cloth control samples was the varying amount of C-14 created by its varying content of nitrogen. We now know that the nitrogen content of any Shroud, blood and limestone samples must be obtained before their C-14 content is measured.

Organic chlorine-35 and organic calcium-40 that are indigenous to the cellulose of the flax plant comprising the linen textile would both be present on the Shroud cloth. During the retting process in which the flax plants are soaked and/or repeatedly rinsed, inorganic chlorine and calcium would become part of the linen; however, these particular inorganic isotopes would have been present once the linen was woven and the hypothetical radiant event occurred. However, since other inorganic chlorine and calcium could also have gotten on the Shroud, and these inorganic amounts may not be evenly distributed, the inorganic chlorine and calcium on the Shroud linen should be measured separately for Cl-36 and Ca-41 in order to be as certain as possible of the amount of neutron flux received by the Shroud sample.

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Control testing should also be performed to determine the minimum size Shroud cloth or blood sample that will be needed for each critical measurement in order to destroy as few samples as possible. In this vein, it should be noted that Jesus' actual burial tomb may not be known or extant. If it is the reputed tomb located at the Holy Sepulchre in Jerusalem, it should also be pointed out that Arabs attempted to destroy this tomb in 1009, but hopefully did not completely destroy every part. A small part of the original limestone is all that would be needed to measure its C-14 and Ca-41. According to Dr. Arthur Lind and Dr. David Elmore, the newly-created C-14 and Ca-41 isotopes would be found about 3 feet within the limestone walls of the tomb because the neutron flux would have penetrated this distance into the limestone.

Most likely the radiocarbon laboratories have Shroud cloth samples and ash or burn residue remaining from their 1988 radiocarbon dating. The size of the Shroud samples given to the laboratories were much larger than necessary for accurately dating the cloth. Even parts of the laboratories' remaining Shroud cloth and ash samples would be large enough to conduct previously described Cl-36 and Ca-41 testing after testing on control samples were completed. In light of the various new research presented at this conference regarding radiocarbon dating, especially the critical, permanent and measurable effects from a neutron flux (along with the other unprecedented effects that particle radiation could also have on the Shroud cloth and its images), it is incumbent on the radiocarbon laboratories to donate parts of their Shroud cloth samples and burn residue still remaining with them. Among the reasons this duty is incumbent is that it may prove their controversial 1988 dating of the Shroud to be erroneous and establish the cloth's actual age. Another reason is that it would make up for the unprofessional conduct that some of the directors of the radiocarbon laboratories displayed during the lengthy eight year process of radiocarbon dating the Shroud [27].

The authorities in Turin, Rome and Jerusalem should also provide the above cloth, blood, charred material and limestone samples from the Shroud and/or Jesus' reputed burial tombs for the proposed tests following the completion of the above control tests. The authorities should not undertake another C-14 test of the Shroud until the tests for particle radiation have taken place on control and Shroud cloth samples. If the Shroud has been irradiated with a neutron flux, but has not been tested for this, then another radiocarbon date is still going to yield a date in the approximate range of 800-1500 A.D. Such a date would not only be erroneous, but could greatly prejudice the public as this would be the second dating demonstrating that the cloth could not have wrapped Jesus. It would make little difference to the public when the Shroud was forged. The public would be much less likely to listen to an explanation about particle radiation after the Shroud was carbon dated twice to the Middle Ages.

I am also very interested in learning about Dr. Campanella's sensoristic approach to dating cellulosic materials presented at this conference. If this dating method can be developed and demonstrated to the scientific community to consistently and accurately date linen it would be much preferable to carbon dating the Shroud for several reasons. There is a good chance that carbon dating the Shroud will yield an erroneous result, if not an inconsistent non-homogenous result. Dr. Campanella's method attempts to date linen independently of its carbon content. If the Shroud was irradiated with a neutron flux, this method could possibly confirm or establish the cloth's true age. While carbon dating and neutron testing are destructive, Dr. Campanella's method only seems to be intrusive.

I would also like to note that Dr. Fernandez Sanchez spoke on the Sudarium of Oviedo that is of interest to many. While this cloth does not have nearly the amount of evidence for its authenticity as the Shroud, the same new tests for particle radiation that are called for with Shroud cloth, blood and charred samples, and on limestone samples from Jesus' reputed burial tombs, could also be conducted on linen and blood samples from the Sudarium of Oviedo. If this cloth was in Jesus' tomb at the time the hypothesized radiant event occurred, unique and otherwise unexplainable levels of Cl-36, Ca-41, Cr-53 and newly created C-14 would also be found within the Sudarium and its blood.

6. CONCLUSION

All naturalistic and artistic methods that have been proposed to explain the Shroud's images or its 1988 radiocarbon dating or other aspects, have not only been tested, but have been found wanting. The proposed tests could establish whether a critical event occurred to the Shroud cloth; its blood and limestone; when the event occurred; the age of the cloth; and where the event occurred. In combination with long established, as well as continually accumulating evidence, the source of this event can easily be determined.

The above tests involving particle radiation, in combination with many other studies with radiation and the Shroud, could readily establish that:

- particle radiation irradiated the Shroud linen, its blood and limestone;
- the particle radiation emanated from the length, width and depth of the dead body wrapped within the cloth;
- the event occurred to a 1st century cloth;
- the event happened inside the reputed Jesus' burial tomb.

Moreover, just by refuting the Shroud's 1988 radiocarbon dating, the proposed tests in combination with all the other extensive evidence acquired throughout

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the 20th and 21st centuries, would provide a wealth of objective, independent and corroborating evidence that every element of the passion, crucifixion, death, burial and resurrection of the historical Jesus Christ literally and actually occurred just as these events are described in the Gospels.

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