Particle Radiation from the Body

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Abstract
This paper highlights some of the main reasons why radiation caused the body images on the Shroud of Turin; why the source of this radiation was the body wrapped within it; that the radiation appears to be particle radiation; and that if particle radiation came from the body of the man in the Shroud, it could account for or explain all of the unique features on the body images and cloth, and a number of unique unexplained events, which no model or method can remotely begin to explain or even attempts to.

Keywords: Turin Shroud, radiocarbon, neutrons, protons

The following is a list of 29 unique or unusual features that are found on the Shroud's body images or fibers:

- lack of fading
- lack of foreign materials or particulates
- superficial encoding
- straw yellow coloration
- uniform coloring around each fiber
- all fibers collectively colored with same intensity
- containing conjugated carbonyls (double-bonded carbon atoms formed after single-bonded atoms within linen fibers broke apart)
- oxidation and dehydration of fibers
- developed over time
- accelerated aging of the body image
- stability to water and heating
- insolubility to acids, redox and solvents
- gross mechanical properties of linen intact
- microscopically corroded appearance of fibers
- lower tensile strength of fibers

- reduction of the cloth's fluorescence
- lack of residue
- highly attenuating or absorbing agent
- agent operated over skin, hair, (coins and flowers)
- non-diffusing image with sharp boundaries
- equal intensity for frontal and dorsal images
- lack of two-dimensional directionality
- negative images with left/right and light/dark
  reversals which develop into
- highly resolved, photographic quality images
- without any magnification
- with skeletal and dental features
- three-dimensionality
- encoded through the space between the body
  and the cloth
- in a straight-line vertical direction.

These features were all gradually observed by scientists when they started studying the Shroud 30-40 years ago. Some of these were first observed by comparing the Shroud's body images to its light scorches, then by making light scorches on linen in the laboratory, by various experiments, and by detailed examination of the Shroud and its samples.

All of these features can be accounted for by radiation and only radiation will account for all of them. Throughout this paper the term radiation refers to non-thermal or low temperature radiation, namely particle radiation. Observe the comments of the late Dr. Luigi Gonella, the former scientific advisor to Cardinal Ballestrero, regarding two of these features:

"An agent acting at a distance with decreasing intensity is, almost by definition, radiation. The limitation of the cloth darkening to the outermost surface pointed to a non-penetrating, non-diffusing agent, like radiant energy." (emphasis added) [1]

Take the further example that vertical beams of light or radiation also best illustrates how the Shroud's body image was encoded through space in a straight-line direction from the body to the cloth. STURP scientist John Heller declared:

"It is as if every pore and every hair of the body contained a microminiature laser." [2]

This vertical directionality of the Shroud's body image has only been accounted for by methods involving radiation. As Dr. Gonella stated,

"Whatever the mechanism might be, it must be such to yield effects as if it were a burst of collimated [parallel beams of] radiant energy." [1]

Because of page limitations, only some of the reasons why radiation caused or contributed to

the Shroud's body images and why the body was the source of the radiation are highlighted in this paper. However, the experiments of Dr. Sebastiano Rodante, Prof. Nicholas Allen and STURP, in which radiation emitted or reflected from a body model also indicate many of these points [3]. This paper draws from and expands the Historically Consistent Method [4] which in turn was greatly influenced by the models and experiments of Dr. John Jackson [5,6], Dr. Jean-Baptiste Rinaudo[7,8,9,10], Mario Moroni [11,12] and their associates.

We know that a body was wrapped within the Shroud. Extensive evidence accumulated from medical examinations throughout the 20th century clearly show the Shroud wrapped a human body. [13] In summary, the arterial and venous blood flows that correspond to arteries and veins in the head; the different types of bruises and swelling identified on the face; the flow of watery fluid from the pleural cavity and of blood from the right auricle, which fills with blood on death; the photographically revealed abrasions of the knees, nose and across the shoulder blades; the abnormally expanded rib cage indicating asphyxia; the enlarged pectoral or chest muscles drawn in toward the collarbone and arms; the contraction of the thumbs from an injury to the median nerve; the unusual signs of traumatic shock; the numerous signs of rigor mortis; the post-mortem bleeding; the microscopically precise, invisible reactions around the more than 100 scourge marks throughout the body; the coagulated blood stains with serum surrounding borders and clot retraction rings that occur with actual wounds and blood flows, found throughout the front and back of the body, and revealed only by modern scientific technology; and the identification of human hemoglobin, human albumin, human whole blood serum, human immunoglobins, and human DNA from the man's blood marks — are just some of the signs that the Shroud wrapped the body of a dead human male.

Let's take a look at some further reasons how and why radiation from this body caused the features on the Shroud. Keep in mind this paper does not even include all the additional arguments in favor of radiation that are given in other papers of this conference.

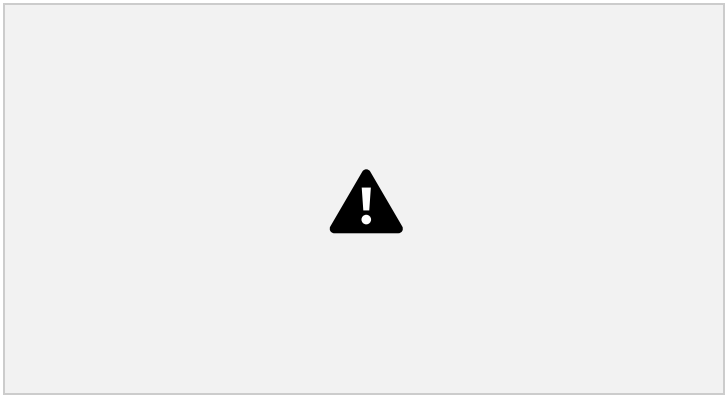


Figure 1. Illustration of the man's weight on the dorsal side of cloth.

The Shroud's frontal and dorsal body images are encoded with the same amount of intensity, independent of any pressure or weight from the body [14]. The bottom part of the cloth (containing the dorsal image) would have born all the weight of the man's supine body [Fig. 1], yet the dorsal image is not encoded with a greater amount of intensity than the frontal image

[Fig. 2]. Radiation coming from the body would not only explain this feature, but also the left/right and light/dark reversals found on the cloth's frontal and dorsal body images.

Beginning with Dr. Giles Carter in 1984 [15,16] and continuing with Dr. John Jackson [5,6], Dr. Gus Accetta [17,18,19] and Dr. Alan Whanger [20], skeletal features such as finger bones, bones extending over the palm, part of the skull at the forehead, the left thumb, parts of the backbone and even teeth have been identified on the man in the Shroud.

Each of these scientists, physicians and long time experts on the Shroud has concluded that only radiation could have encoded such internal features onto the cloth. And, while these experts may vary somewhat in the particular form of radiation involved, all have concluded that only radiation projected from the body could have encoded the man's skeletal and dental features.

All these internal skeletal (and dental) features lie near the surfaces on the front and back of the supine body of the man wrapped in the Shroud. Like all the Shroud's body image features, they are encoded correctly, and none were visible for hundreds of years — until the development of modern technology.

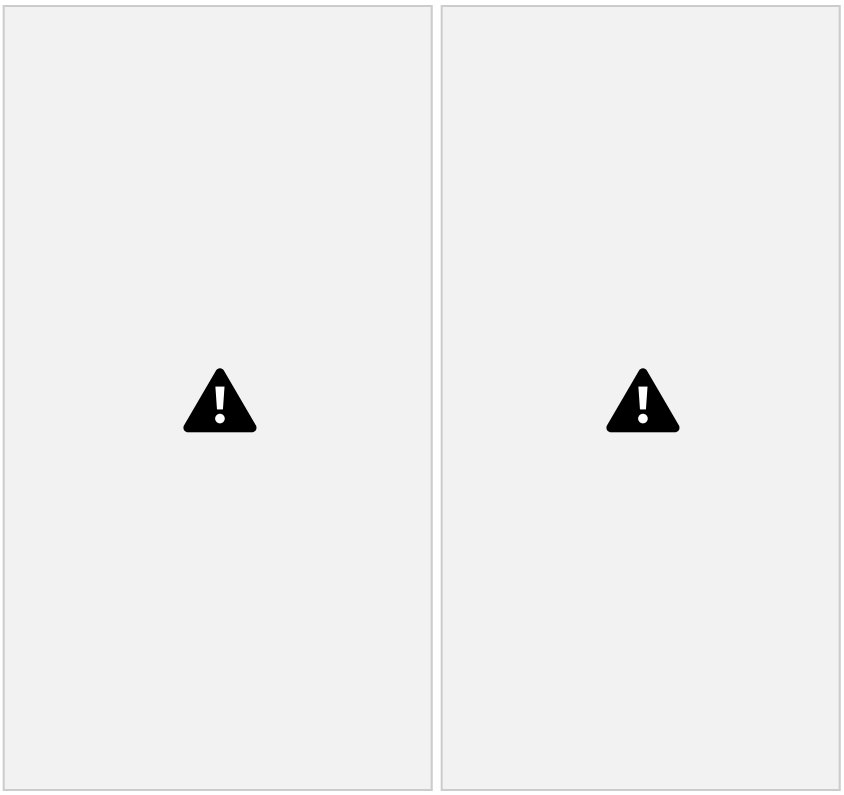


Figure 2. Negative, contrast-enhanced frontal and dorsal images on Shroud.

Dr. Carter, who first identified these features, thought they indicated not only that radiation came from the body, but that it resembled or had qualities analogous to X rays. [15,16]. Interestingly, enlargement and diffusion of the body's bones, ligaments, and skin normally occurs when X-rays are made. That is because the rays leave an external tube before hitting a part of a person's body and being recorded on film. The degrees of magnification and diffusion

vary with the degrees of distance. The shorter the distance between the source of X-rays and the film, the greater are the degrees of enlargement and diffusion. For the short distances that necessarily existed between the Shroud cloth and the underlying body, extensive enlargement and diffusion would have clearly been present if the source of radiation came from outside the body. However, the Shroud's body images are highly resolved without any enlargements. Both attributes indicate that the source of the light came from the body itself.

As in photography, if the light came from any source outside of the body, or outside the cloth, or outside the tomb, objects that were illuminated by the light in its path from its source to the film would have been recorded on the film or images. In the case of the Shroud, the film is clearly the inside part of the cloth that wrapped the body. Significantly, neither the outside or inside of the tomb, nor the outside or inside of either the front or back sides of the cloth are found on the Shroud's distinctive images. Only the front and back sides of the man's body are seen on the Shroud's extraordinary images. This means that the source of the light does not originate outside of the body, the cloth, or the tomb, but with the body itself. The weave of the inner part of the cloth containing the frontal and dorsal body images is not even part of the distinctive images, which they, too, would have been, if the light came from anywhere outside the body.

Everyone knows of the truly proportional, full-length, three-dimensional frontal image that is uniquely encoded on the Shroud. This was first demonstrated with a VP8 analyser that showed a direct correlation between the lightness and darkness at each point on the Shroud's body image and their various distances from the underlying body as shown in Figure 3 [14]. Since each of these highly specific degrees of lightness indicating their various distances from the body was received by the cloth and is contained on the cloth — they could only have come from the underlying body.

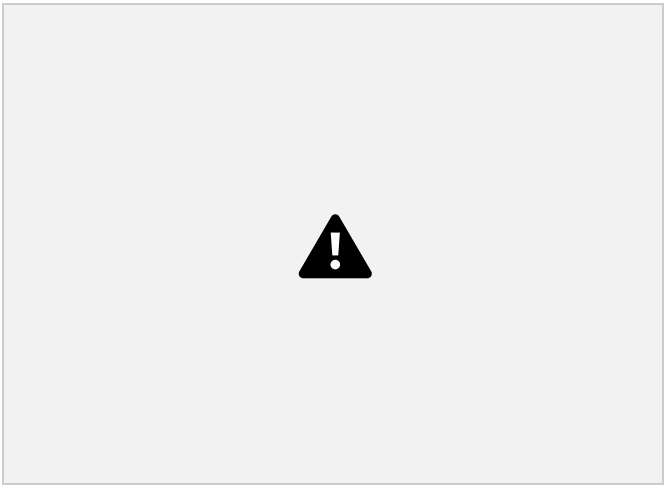


Figure 3. Three-dimensional VP8 image of face.

When the two men at each end of the body in Figure 4 below let go of the cloth, the top of it will conform roughly to the contours of the underlying body. Yet, regardless whether the Shroud was sloping downward, upward, or was relatively flat, all parts of the frontal body image were encoded in a vertical straight-line direction from the cloth to its corresponding and underlying

points on the body. Since this vertical directionality exists even where the cloth was not touching the body, the image was encoded through this space. These features also had never been seen before in all of history.

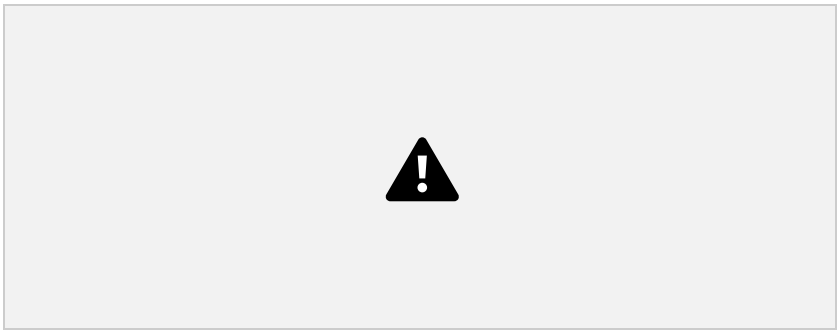


Figure 4. Illustration of vertical directionality

Like the three-dimensional argument, since this unique vertically encoded information was also received by and is contained on the cloth, it too, could only have come from every part of the body directly below it.

The above are just some of the ways it can be shown that radiation coming from the body caused the images on the Shroud. However, when one considers that:

- all 29 of the various unique properties enumerated in the previous list are only found throughout the length and width of the anatomically flawless frontal and dorsal body images;
- the full-length body images are encoded only on the interior parts of the cloth that wrapped the tortured and crucified corpse; and
- all the itemized features of the body images can only be duplicated by radiation

We can be very confident that the source of this radiation and information could only have been the body wrapped within this cloth.

* * * * * * * * * *

In the mid-1990's, Dr. Kitty Little, a retired nuclear physicist from Britain's Atomic Energy Research Establishment in Harwell began writing about one particular source of radiation that had not been considered before. [21,22] She recalled that in 1950 she had irradiated several different cellulose fibers at the nuclear reactor in Harwell with particle radiation — radioactive illumination consisting of combinations of protons, alpha particles, neutrons and gamma rays. In the mid-1990's, Fr. and Dr. Jean-Baptiste Rinaudo of the Faculty of Medicine of Montpellier, France, began performing intriguing experiments with protons and neutrons. [7,8,9,10] Figure 5 shows one of his proton-irradiated linen cloth samples. As many of you know, neutrons and protons behave very differently. Neutrons are very penetrating and, like gamma rays, easily pass through linen cloth. Protons have very short ranges; they are so non-penetrating that they even absorb or attenuate in air. Protons, neutrons and electrons are the main building blocks of matter, and are found in immeasurable abundance in all bodies. (A deuteron and an alpha particle contain one or two protons and neutrons, but both behave like a proton, and are among the simpler things that result from these building blocks. Therefore, throughout this and

subsequent discussions, where protons are specifically mentioned, similar results would be expected for deuterons, alpha particles or other heavy charged particles.)

Rinaudo and Little's results indicate that protons within particle radiation can duplicate or account for all of the items in the original list of 29 body image features. In particular, Rinaudo even showed how the superficial straw-yellow coloration produced could not be extracted with all types of acids, redox or solvents, but immediately disappeared with the application of diimide, like the Shroud's coloration. [23] He also demonstrated that like the Shroud's coloration, his could develop over time if the irradiated linen was artificially aged by heating at low temperatures.

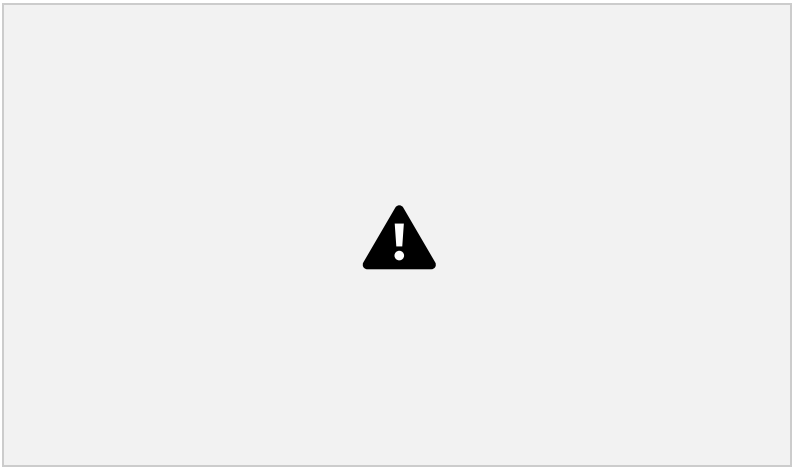


Figure 5. Photomicrograph of a proton irradiated linen cloth shows a very similar appearance to the body image area on the Shroud.

John Jackson's original cloth collapse hypothesis was developed strictly from considerations of the Shroud's image properties after he observed that all naturalistic and artificial image creating models had been tested and failed. [5,6,14] Dr. Jackson's model claims that if the body of the man in the Shroud became insubstantial and emitted ultraviolet light that the Shroud's primary and secondary body image features could have been encoded on the cloth. While ultraviolet light is a good candidate, it has some shortcomings; however, the cloth's momentary collapse into an area of radiation once occupied by the body is a critically important concept.

It has been known for decades that the Shroud wrapped the dead body of a man who suffered all the same wounds and tortuous events that occurred to the historical Jesus Christ. It is also known that the cloth had intimate contact with the body even in the many places that the draped cloth would not have originally been in contact with the body. It has also been known for decades that within two to three days of having been wrapped in the Shroud, the body left the cloth in a mysterious manner. In light of all the above information, let us ask a more fundamental and precise question. What if the man's body became insubstantial or dematerialized instantly leaving behind some energy in the form of the basic particles of matter, such as protons, neutrons and electromagnetic waves, such as gamma rays?

The draped cloth would fall by gravity in a vertical straight-line direction into the radiant energy.

(Only vertical directionality, and not longitudinal or latitudinal directionality, would be encoded.) The part of the draped cloth that was originally closest to the body would have received the most radiation while the part originally farthest away would have received the least, yet both parts and all parts in between would have received proton (deuteron and alpha particle) radiation, and their respective amounts would have been in direct correlation to their original distances from the underlying body. This would result in true three dimensional information being encoded onto the two dimensional cloth with the lightness and darkness at each and every point of the frontal body image being directly correlated to their original distances from the body when the cloth was first draped over it, precisely as it is found on the Shroud.

Since this image encoding event occurs rapidly, the cloth would only be partially through the body region when the radiation ceased, thus only internal skeletal features closest to the body's surface (e.g. the hands, face, and teeth) would become encoded just like those found on the Shroud. This also explains the dark spot underneath the high point of the man's hands and why his internal organs are not encoded. With this proposed method, there could also be discoloration or imaging on the back side of the cloth behind the face and hands (the high points of a supine body), which some scientists have identified at these locations on the back side of the Shroud. [24]

Because the cloth fell straight down receiving heavy charged particles only from the part of the body directly underneath it, a highly detailed negative image would be encoded on the cloth. As the cloth fell into the radiant region, the heavy charged particles would stop as they struck its topmost superficial fibers. As the cloth oxidized and dehydrated while it aged, a superficial straw yellow discoloration consisting of conjugated carbonyls, would occur on the linen fibers where they were irradiated by the protons, deuterons, and alpha particles. The colored fibers would be uniformly encoded, yet would be weaker and more corroded or friable than the non-image fibers, while having all the other characteristics listed at the beginning of this paper.

This method, called the Historically Consistent Method [4], not only explains all of the primary features of the Shroud's body image and their fibers, but also accounts for all secondary body image features found on the Shroud. The body's disappearance would cause the cloth to collapse downward at first and then horizontally as it flattened. This would explain how the blood marks originally on and at the sides of the man's forehead became displaced into the part of the cloth where the man's hair is imaged. [25,26,27] See Figure 6.

The cloth's collapse into the body region would also encode such distorted features as the man's elongated fingers, the lateral distortion at his hips, and the oddly encoded features at the sides of and below his head and face, none of which would be encoded by a forger, and all of which are on the Shroud. [5,6] When the body dematerializes, a small vacuum would be created that would draw or pull the dorsal cloth up a short distance into the body region encoding body image and blood marks on the dorsal side. Particle radiation given off at the body's dematerialization also explains how the faint subtle coin or flower images, if present on the Shroud, could have been encoded under this method. [4]

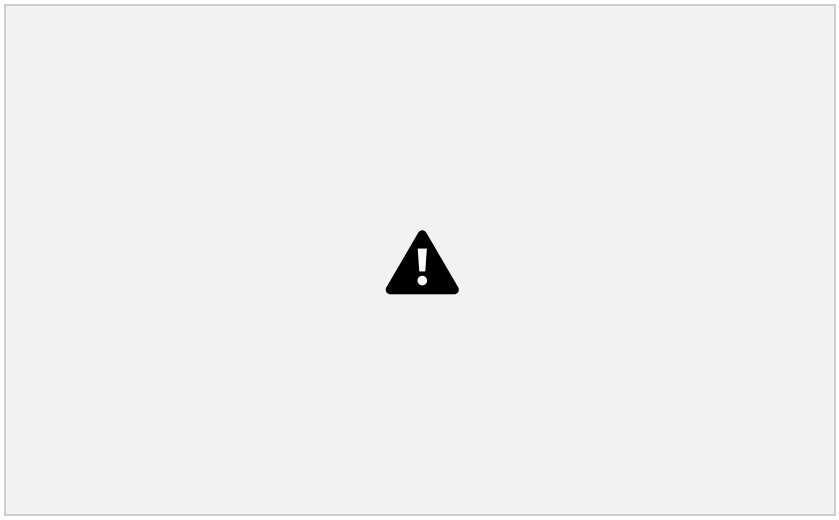


Figure 6. Dr. Lavois' demonstration of why blood appeared to be in the hair

In 1988 three radiocarbon laboratories determined that the Shroud dated to 1325 AD. Experiments [7-12] have shown that neutron particles can alter the radiocarbon date of linen by increasing its radiocarbon (carbon-14) content to cause the Shroud to date to 1325 instead of 33 AD. More recent experiments [28] have demonstrated that the carbon-14 created by the neutrons remain within the molecular structure of the cellulose and are not removed despite natural aging or the application of heat or stringent standard pretreatment cleanings, all of which occurred to the Shroud. These experiments are continuing with the goal of measuring Shroud material to determine if the Shroud received neutron irradiation and how much it received. This information could prove a radiation event occurred and could determine the Shroud's true actual age.

Particle radiation emanating from the man in the Shroud could not only explain the cloth's aberrant 1988 radiocarbon date, determine the cloth's true actual age, and account for the Shroud's primary and secondary body image features, but it can also explain the cloth's excellent condition, and the still reddish color of its blood marks after all these centuries.

If the Shroud had been irradiated with neutrons, gamma rays and electrons, a very small fraction of them would have caused a limited number of molecular bonds to break and reform in the non-crystalline regions, thus cross-linking these molecules. According to Dr. Little, "This type of cross-linking also reduces solubility and susceptibility to oxygenation and other chemical reactions, which would account for the lack of degradation and 'aging' that might be expected in a material 2,000 years old, and that had been subjected to repeated handling and ill-treatment." Dr. Little continued: "Such a reduced chemical activity would also account for the fact that although the Shroud was reported to be covered with mildew spores there were no mildew reactions, so that the fabric was unharmed." [29]

The late Dr. Carlos Goldoni recently undertook experiments to explain why the Shroud's bloodstains not only still have a reddish coloration, but when exposed to sunlight, they take on a bright red coloration despite the passage of many centuries. He found that blood marks first exposed to neutron irradiation and then to ultraviolet light (such as the Shroud would have naturally received from sunlight during exhibitions) resulted in a bright red coloration of the

blood marks regardless of their bilirubin content. [30]

The evidence acquired from more than a century of scientific, medical, archaeological and historical examination of the Shroud is not only consistent with its authenticity as the burial garment of the historical Jesus Christ, but with every element of his passion, crucifixion, death, burial and resurrection as described in the Gospels. We know that the Shroud not only wrapped a dead body, but that it had intimate contact with every part of the body and its blood marks; even those not originally in contact with the draped cloth. The body has obviously left the Shroud, but since there are no decomposition stains, it left within two to three days of having been wrapped within the cloth. None of the more than 130 blood marks on the front and back of the Shroud's body images are broken or smeared; however, if the cloth had been removed by any human or mechanical means — some, most or all of these intimately encoded blood marks would have been broken or smeared. The disappearance or dematerialization of the body wrapped within the Shroud is not only consistent with the Gospel accounts of Jesus' resurrection, but is a critical component of the Historically Consistent Method that was derived from the cloth's numerous image property considerations. The Shroud's primary and secondary body image features cannot be encoded under this method without the body's sudden disappearance. The sudden disappearance of the body following the passion, crucifixion and death is another consistency between the Historically Consistent Method and the historical Gospel accounts.

If the body in the Shroud, or Christ's body, disappeared or dematerialized into energy without rematerializing, an explosion many times greater than Hiroshima would have occurred. Obviously, no such explosion occurred for it clearly would have destroyed the Shroud and all of Jerusalem. The small amount of particle radiation that encoded the superficial body images on the Shroud would not have caused a large explosion either, but would have other significantly consistent results. The neutrons and gamma rays within this particle radiation would have penetrated about a meter within the limestone walls of the tomb. Rather than an explosion, this penetration could have resembled the earthquake on Easter morning described in Matthew 28:2 and 27:51-53. [31]

Of all the miracles and deeds attributed to Christ in the Gospels, his body was not reported to suddenly disappear or dematerialize, or to reappear or suddenly appear, until the accounts of his resurrection and afterward. In Luke 24:31, Jesus' entire body was said to literally vanish when he broke bread with two of the apostles on the road to Emmaus; however he soon reappeared in person among the apostles, thereby startling and frightening them (Luke 24:36-43). The Gospels describe Jesus as appearing in full body numerous times following his resurrection. In two separate instances in John 20, Jesus appeared in full body after the apostles had gathered within closed rooms.

The Shroud's unbroken and unsmeared blood marks are not just encoded, but are <u>embedded</u> in the cloth in the same shape and configuration as when they formed and coagulated on the body. Upraised edges with indented centers and serum surrounding borders are seen around each of the more than 100 scourge marks by using photographic enlargers and ultraviolet lighting. Serum surrounding borders with clot retraction rings are also observed on the blood marks throughout the Shroud's body images, even where the cloth would not have originally been in contact with the body and its blood marks. Direct contact alone has not and can not

embed or fully encode all the Shroud's various blood marks and their intimate features.

Under the Historically Consistent Method, when the body dematerializes or disappears, it allows the frontal side of the cloth to fall through the region once occupied by the body (while the dorsal side is drawn up into it by a small vacuum). Because the blood marks consist of the same molecules, atoms, DNA, etc. as the body, they, too, disappear or dematerialize allowing the cloth to pass through them. As we discussed earlier the entire process occurs quickly, and when the blood marks, like the body, return to matter quickly, they become trapped or embedded in the cloth in the same exact shape and configuration as when they formed and coagulated on the body. Under this method, even the blood marks not originally in contact with the Shroud become embedded within it. [32]

It is compelling to note that none of the various Gospel accounts of the first sightings of Jesus on Easter Sunday by several different people describe him as having any of the bloodstains on his person that he necessarily would have had from his scourging, being crowned with thorns, stabbed in the side, and nailed in both of his wrists and feet. The man in the Shroud, who suffered the same wounds as Jesus, is literally bloodied from head to feet. A man's 130 complete blood marks would not have naturally transferred by direct contact onto his burial shroud in the same shape and form as when they flowed and coagulated on his body. If they would, this would have been documented more than once and we would see countless blood marks like those on the Shroud on many other burial garments, sheets, blankets, shirts, jackets etc. that have been placed on dead bodies for centuries — but we don't. Many of the blood marks would have remained on the body in whole or in part. The Gospel descriptions are completely consistent with all of the various coagulated blood marks on the outside of Jesus' body being transferred onto his shroud at the time of his disappearance and resurrection.

Only the Historically Consistent Method explains or accounts for all of the Shroud's primary or secondary body image features; its blood marks; their still red color; its backside imaging; its possible coin or flower images; its excellent condition; and its 1988 radiocarbon dating. This method is completely consistent with the resurrection of Jesus Christ as described in the Gospels, and, perhaps, adds some insight to the most critical event in history. This method or image-encoding event also explains several other events described in the Gospels that no other method begins to explain or even attempts to.

It should also be noted that any insight added by the Historically Consistent Method to the resurrection or the Shroud's image-encoding event does not seem to violate the laws of science.

One possible explanation as to what happened to the historical Jesus Christ, or the man in the Shroud, when his body disappeared was first introduced in a highly respected scientific journal in 1935 by Albert Einstein and Nathan Rosen. [33] They first devised the concept of a shortcut in space-time travel based on Einstein's theory of general relativity that allows a person or object to pass through a bridge or "wormhole" in space and time. According to modern physicists, mathematical theories of space-time travel are not only possible under Einstein's theory of general relativity, but these wormholes are completely consistent with tested theories of gravity and would allow travel between two points in different universes or two points within the same universe. This form of travel could circumvent the speed of light barrier and may even permit travel to past or future times. The famous British physicist Steven Hawking has published and lectured on wormholes, and his bestselling book, *A Brief History of Time*, devotes

whole chapters to this subject. At this time the science of wormholes is not only mature, but in the words of physicist Matt Visser in *Lortenzian Wormholes: From Einstein to Hawking*, "…the theoretical analysis of Lortenzian wormholes is 'merely' an extension of known physics — no new physical principles of fundamentally new physical theories are involved." [34]

Keep in mind that only a tiny fraction of the atoms are needed to disintegrate to encode the Shroud's superficial images. A key element of this theory is that, as matter passes through the wormhole, the entrance and exit mouths of the hole gain and lose mass, which can be acquired from and returned anew to the matter itself. An object could even traverse the wormhole as energy and return to its former mass upon its exit. If the unexplained disappearance of the man in the Shroud, or the historical Jesus Christ, was connected or related to this theory, the entrance mouth to the wormhole would be the point of the body's departure. The Shroud itself would have been right at the mouth of the entrance and may have received some of the increase in mass in the form of the basic building blocks of matter — protons, neutrons, electrons and alpha particles. Space-Time travel could even be said to be a possible means for Jesus to have traveled between heaven and earth. Space-Time travel would not involve an explosion nor did one occur in any of the several examples above where Jesus suddenly disappeared or dematerialized and reappeared subsequently elsewhere.

Only the Historically Consistent Method, in which particle radiation was released from the disappearing body within the Shroud, can account for all of its many unique blood marks, its unprecedented images and non-image features, its aberrant radiocarbon dating, the resurrection and several additional events in history.

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REFERENCES

1. L. Gonella, "Scientific Investigation of the Shroud of Turin: Problems, Results and Methodological Lessons." In *Turin Shroud—Image of Christ?* (Hong Kong: Cosmos Printing Press Ltd. 1987), pp. 29-40, 31.
2. As quoted in W. McDonald, "Science and the Shroud," *The World and I*, (Oct. 1986): 420-428, 426.

3. M. Antonacci, *The Resurrection of the Shroud,* Chapters 3, 5 and 10, (New York: M. Evans and Co., 2000).
4. M. Antonacci, *The Resurrection of the Shroud*, Chapter 10.
5. J. P. Jackson, “Is the Image on the Shroud Due to a Process Heretofore Unknown to Modern Science?” *Shroud Spectrum International* 34 (March 1990): 3-29.
6. J. P. Jackson, “An Unconventional Hypothesis to Explain All Image Characteristics Found on the Shroud Image,” *History, Science, Theology and the Shroud,* A. Berard, ed. (St. Louis: Richard Nieman 1991), pp. 325-344.
7. J. Rinaudo, “Protonic Model of Image Formation on the Shroud of Turin,” *Third International Congress on the Shroud of Turin,* Turin, Italy, June 5-7, 1998.
8. J. Rinaudo, “A Sign for Our Time.” *Shroud Sources Newsletter*, May/June 1996, pp. 2-4.
9. J. Rinaudo in *British Society for the Turin Shroud Newsletter*, No. 38, August/September 1994, pp. 13-16.
10. J. Rinaudo, “A New Stage,” *Il est Vivant*, No. 89, March/April 1992.
11. M. Moroni, F. Barbesino, and M. Bettinelli, “Verification of an Hypothesis of Radiocarbon Rejuvenation,” *Third International Congress on the Shroud of Turin* Turin, Italy, June 5-7, 1998.
12. M. Moroni, F. Barbesino, and M. Bettinelli, “Possible Rejuvenation Modalities of the Radiocarbon Age of the Shroud of Turiln,” *Shroud of Turin International Research Conference,* Richmond, VA, June 18-20, 1999.
13. M. Antonacci, *The Resurrection of the Shroud*, Chapter 2.
14. J. P. Jackson, E. JK. Jumper, and W. R. Ercoline, “Correlation of Image Intensity on the Turin Shroud with the 3-D Structure of a Human Body Shape,” *Applied Optics* 23.14 (July 1984): 244-70.
15. G. F. Carter, “Formation of the Image on the Shroud of Turin by X Rays: A New Hypothesis,” *ACS Advances in Chemistry No. 205 Archaeological Chemistry* III, J. B. Lambert, ed. American Chemical Society, 19884, pp. 425-446.
16. G. F. Carter Interview, May 23, 1999, http://earthfiles.com/earth025.html.
17. A. D. Accetta, “Experiments with Radiation as an Image Formation Mechanism,” *Shroud of Turin International Research Conference,* Richmond, Va., June 18-20, 1999.
18. A. D. Accetta, Lecture at the Dallas Shroud Meeting, Dallas, Tex., November 6-8, 1998.
19. A. D. Accetta, “Nuclear Medicine and its Relevance to the Shroud of Turin,” *2000 Sindone Conference,* Orvieto, Italy, August 27-29, 2000.
20. M. and A. Whanger, *The Shroud of Turin: An Adventure of Discovery* (Providence House Publishers, Franklin, Tenn., 1998). Pp. 111-115.
21. K. Little, “The Formation of the Shroud’s Body Image,” *British Society for the Turin Shroud Newsletter*, No. 46, November/December 1997, pp. 19-26.
22. K. Little, “The Holy Shroud and the Miracle of the Resurrection,” *Christian Order* (April 1994): 218-231.

23. Personal communication by Dr. Rinaudo.
24. G. Fanti and R. Maggiolo, “The Double Superficiality of the Frontal Image of the Turin Shroud,” *Journal of Optics* 6 (April 2004): 491-503.
25. The blood marks’ location in the hair was first explained by Dr. Gilbert Lavoie and was an important influence in Jackson’s development of the cloth collapse model. G. R. Lavoie, B. B. Lavoie, and A. D. Adler, “Blood on the Shroud of Turin: Part III,” *Shroud Spectrum International* 20 (Sept. 1986): 3-6.
26. G. R. Lavoie, *Unlocking the Secrets of the Shroud* (Allen, Tex.: Thomas More, 1998).
27. G. R. Lavoie, *Resurrected*, (Allen, Tex.: Thomas More, 2000); pp. 101-111.
28. A. C. Lind, M. Antonacci, D. Elmore, G. Fanti and J. Guthrie, “Production of Radiocarbon by Neutron Irradiation on Linen,” International Workshop on the Scientific Approach to the Acheiropoietos Images, Frascati, May 4-6, 2010.
29. K. Little, “The Formation,” p. 24.
30. C. Goldoni, “The Shroud of Turin and the bilirubin blood stains,” Proceedings of the 2008 Columbus International Conference, Shroud Science Internet Group, Aug. 14-17, 2008, edited by G. Fanti.
31. See also Little, “The Holy Shroud,” p. 225.
32. Any round surface, such as the back of a man’s head, will only make contact at one point with the floor or a cloth spread on the floor. Most of the contact on the dorsal side of a supine body will be at the shoulder blades, buttocks and upper legs. The top parts of the shoulders and much of the lower back will not make contact with the cloth or floor. Much of the upraised left leg will also not be in natural contact. Even the use of the side strip to loosely bind the Shroud around the man, as claimed by John Jackson, cannot account for the complete and intimate contact by all the blood marks throughout both sides of the body with the Shroud. Nor can such binding explain the blood marks being embedded in the Shroud in the same shape as when they formed and coagulated on the body.

33. A. Einstein and N. Rosen, “The Particle Problem in the General Theory of Relativity.” *Physical Review* 48 (1935): 73-77.
34. M. Visser, *Lortenzian Wormholes: From Einstein to Hawking* (Woodbury, N.Y.: American Institute of Physics, 1996) p. 369.

PHOTO CREDITS

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Fig. 6. Courtesy, Dr. Gilbert Lavoie.