Photogrammetric Responses From The Shroud of Turin

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Abstract

The unique results produced by simple studies of the Shroud of Turin sets this particular artifact apart from all other known artifacts. When photographed, the Shroud image appears more clearly to the human eye in the photographic negative than in the photopositive. When image-processed by a VP-8 Image Analyzer, the Shroud image produces a three-dimensional response unlike any other image so processed. The content and composition of the Shroud image induces these unique results. Without alteration, modification, or fabrication of the common processes involved, the products of these studies are unlike any other known to exist.

Photography and the Shroud of Turin

In 1898, Secundo Pia made the first photographs of the Shroud of Turin. The process included emulsions on glass plates. The emulsions hardened where exposed to light energy. Secundo Pia focused his lens on the Shroud of Turin, closed the lens, installed the glass plates, and opened the lens for a short period of time. The light, reflected from the Shroud, passed through the lens. Photons landed on the emulsions, and the lens was again closed. This is the common process of conventional photography. It is the same now, as then. However, the products resulting from Shroud photographs are unique.

When Pia's plates were developed, the photographic negatives made the subtle details on the Shroud much more vivid, and much easier to "interpret" by the human visual system. The actual image on the Shroud of Turin is very "faint" (low in contrast). It is difficult to orient oneself, relative to the image, if the observer is in close proximity to the cloth. Even if the observer is close to a full-scale positive color photographic image of the cloth, viewing details is difficult. However, photographic negative images of the Shroud are more easily interpreted. Details are easier to see.

This does not mean that the Shroud of Turin is a photographic negative. However, the products (negatives) of the conventional photographic process, applied to the Shroud of Turin, are unique relative to the products of photographs of other known objects. This includes photographs of art objects, such as, drawings or paintings.

It might be possible to produce, fabricate, modify, or alter the image of an object so that, when photographed, the resulting negatives would begin to resemble Shroud negatives. However, the Shroud of Turin is at least 650 years old, by any consideration. No modification, fabrication, or alterations of the physical reactions are required in taking a Shroud photograph. The methods used are the same used in making any other photograph. Yet, the results of Shroud photographs have these unique characteristics. The photons rebound from the cloth, pass through the lens, harden the emulsion, and the result exists. No image studied, made prior to photography, or

made after its invention, produces the same results as those observed relative to the Shroud of Turin image.

One would think that an artist's goal is to make an image that is clearly and easily interpreted by the human visual system. One would not think that an image of low clarity and faintness of detail would be created at least 550 years in advance of the invention of a method (photography) to view the "subtle" details. It is important to note, no photographic enhancement method, such as "dodging", "push-processing", or "non-uniform illumination", is needed to produce these unique results in a conventional photographic negative of the Shroud of Turin. It is reasonable to question how, and why, an artist might fabricate a work that responds so differently, when photographed, compared to all other "artistic works". It is not reasonable to suggest the artist could "predict the outcome" (photo-negative) of the work before any reference to a specific "outcome" had been established. The artist would have to fabricate the image to produce those specific results without any reference by which to perform "quality control" of the work. Then, the artist would produce only one known work of this type, protect the method so no other works of this type could be produced, and be without fame for the talents, skills, and processes required. Artistic copies and artists' illustrations of the Shroud do not produce the same results when photographed, as photographs of the Shroud produce.

Consider the following: The Shroud of Turin induces a result through photographic imaging that is unique, compared to all other photographic results taken from other objects of the same acknowledged period as the Shroud, of prior periods, and to the present day. It is the "data" existing on the Shroud of Turin, which induces the unique photographic results. Therefore, the Shroud image, itself, is unlike any other object or image known to exist.

Image Analysis

In 1972, the VP-8 Image Analyzer was invented. I was responsible for taking the design to production and delivery. I designed and documented the production units. For six years, I installed the units and trained operators. I became familiar with many different types of images and applications for this image-processing instrument.

In about 1976, I delivered and installed a unit at the home of Captain Eric Jumper, USAF. Captain John Jackson, USAF, was present. I dutifully installed the system, and verified the calibration. I then trained Jumper and Jackson in the operation of the system. What happened next was extraordinary to me. The results were, to say the least, "unique".

Jackson placed an image of the Shroud of Turin onto the light table of the system. He focused the video camera of the system on the image. When the pseudo-three-dimensional image display ("isometric display"), was activated, a "true-three-dimensional image" appeared on the monitor. At least, there were many traits of real three-dimensional structuring in the image displayed. The nose ramped in relief. The facial features were contoured properly. Body shapes of the arms, legs, and chest, had the basic human form. This result from the VP-8 had never occurred with any of the images I had studied, nor had I heard of it happening during any image studies done by others.

I had never heard of the Shroud of Turin before that moment. I had no idea what I was looking at. However, the results are unlike anything I have processed through the VP-8 Analyzer, before or since. Only the Shroud of Turin has produced these results from a VP-8 Image Analyzer isometric projection study.

The VP-8 Image Analyzer is an analog video processing device. The "isometric display" is generated on a cathode ray tube, like that of an oscilloscope. It is like a home television set, except the scanning and positioning of the video image is controlled by electrostatics (voltages), rather than by electromagnetism (currents). The picture is monochrome, or black and white, television. However, the isometric image is "shades of green" rather than "shades of gray", due to the type of the cathode ray tube used.

The isometric display uses the changes of brightness, as they occur in an image, to change the "elevation" on the display. If something is bright, it goes up. If something is dark, it goes down. If it is some gray shade in-between, it produces an "elevation" in between something very bright and something very dark.

The isometric display was never intended to produce a "real-three-dimensional" display. A snow-covered peak would look like a high, flat surface, while a rock sitting on top of the snow would look like a deep hole in the high surface. Light reflecting from a stream at the bottom of a valley would appear to be a high elevation, perhaps even higher than the snow on the peak of the mountains. Dull rocks and dark vegetation would appear to be lower than the water of the stream. In other words, objects are not as tall or short, high or low, as their reflectance of light might indicate. There is no correlation between reflectance and altitude.

The purpose of the isometric display was to make it easier to follow patterns of changes in shades of gray within an image. Particularly, the light pattern changes in reflection of light from soils and vegetation near a fault line were of interest. Following patterns of soil types and vegetation types was also of interest. But in no case was there ever any indication on the isometric display of how high or low, how tall or short something was.

In looking at the facial area of the ventral image of the Shroud of Turin, one observes a generally proper "ramping" of the nose, a "rounding" of the face, and "shaping" of the lips, eyes, and cheeks. The isometric display is mapping responses to light energy, but the result induced by the image is altitude-relevant. This is a unique response.

This result is induced over the entire ventral image and appears to be somewhat in presence on the dorsal image. What is important to note is the similarity of the isometric display response to the actual shape of a person. There are many deviations caused by "Shroud noise", such as, stains on the cloth, the weave of the cloth itself, and other easily identifiable sources. But the basic image information is readily observed as a relatively accurate "three-dimensional" body image.

The VP-8 Image Analyzer can vary the elevation scale (Z axis) relative to the X and Y axis scale. The VP-8 cannot change the linearity of the Z axis response, unless the unit is un-calibrated or the camera is improperly operated. A change of 10 percent in the incoming light

level will produce an elevation change of 10 percent on the Z axis. It is a direct, linear function. The VP-8 can change the image polarity from bright-is-up to bright-is-down, but this is simply changing photographic response from negative to positive polarity. Therefore, a photographic positive or negative can be used, if the isometric polarity control is properly selected.

The Shroud image induces a response in the isometric display of a VP-8 Image Analyzer that is unique. Each point of the Shroud body image appears at a proper "elevation". Is this due to the distance the cloth was from a body inside it? Is this due to the density of the human body at various points in the anatomy? Is it a result of radiant energy? These questions cannot be answered by the VP-8 Image Analyzer. However, the related theories can be rightfully posed. The isometric results are, somehow, three-dimensional in nature. The displayed result is only possible by the information ("data") contained in the image of the Shroud of Turin. No other known image produces these same results.

If one considers the Shroud image to be "a work of art" of some type, then one must consider how and why an artist would embed three-dimensional information in the gray shading of an image. In fact, no means of viewing this property of the image would be available for at least 650 years after it was done. One would have to ask, (assuming this is a "natural result" in some style or type of art), "Why isn't this result obtained in the analysis of other works?" Or, if this is a unique work, "Why would the artist make only one such work requiring such special skills and talent, and not pass the technique along to others?" How could the artist control the quality of the work when the artist could not "see" gray scale as elevation? Did the artist predict the outcome before the outcome could be defined? Would an artist produce this work before the device to show the results was invented?

The VP-8 Image Analyzer's isometric display is a "dumb" process. That means it does one process on whatever "data" is sent to it. In that regard, it is quite like Secundo Pia's photography. The photons come from the image through a lens, onto the sensitive material in a television camera. The photons are converted to electrons, causing more voltage to be present where the picture is bright and less voltage where it is dark. The isometric display plots out bright and dark as elevation. Like a photographic negative, the process is not "involved" in the result. It is simply photons in and voltage out. The Shroud image induces the three-dimensional result. It is the only image known to induce this result.

It might be possible to fabricate, alter, enhance, or modify an image, or imaging process, to produce roughly similar results. But, the Shroud image is at least 650 years old, and it is the only one that will induce these results by simply scanning it into a "dumb" processor. An artist today would have the advantage of being able to view the VP-8 image process result of his work. He could perform "quality control" on the work. And, he would have the information of how to create an input that would produce the result. But, VP-8 Image Analyzers were not available in 1350. Yet, the result is here today.

The Shroud image has brought forth a flood of "explanations" as to what is seen. There are "conclusions" as to the cause, composition, and method for Shroud image formation. Most of these "explanations" or "conclusions" are used to further theories as to the Shroud's "authenticity" or its "trickery". Photogrammetric analysis can be quite simple in explaining why

some of these theories and conclusions are impossible. I have heard no sound explanation as to how the Shroud image can be fabricated through any known means or technology.

Iron pigment is simply not possible for image formation. Iron pigment, no matter how thin the mixture, will produce a specific spectral signature that is not present on the Shroud in the image areas, or anywhere else on the Shroud, in sufficient total area of presence to cause formation of the image. Iron pigment, when evenly surface-illuminated, would produce the same reflectance response, thus producing a flat elevation on the VP-8 isometric display. This result is not observed on the Shroud.

Iron pigment is more reflective than transparent. When an iron pigment is exposed to light, more photons will be reflected than will pass through the iron pigment to the other side. Some photons will be absorbed. Therefore, if an iron pigment image is lit from behind, it will "block" (absorb and reflect) more of the light than it will allow to pass to the other side. This would result in a much higher contrast photograph of the iron pigment image. This is as if the image was illuminated from behind the "canvas", while photographing from in front of the "canvas". So, the result would be a more clearly defined, more detailed, photograph. However, when illuminated from behind, the Shroud image is not clearly visible. It is not discernable. Blood stains, water marks, and other features that absorb and reflect more light than they allow to pass, are more clearly visible.

Density slicing is another function of the VP-8 Image Analyzer. This is a process of grouping light-reflectance levels. For example: An aerial photograph might show fields of wheat, a lake, and several strips of ground that have been plowed for planting. Each of these individual features in the aerial photograph will have generally similar reflectance values. The VP-8 density slicing function can be used to select the range of reflectance values that generally represent selected features within an image. For our example, we could assign the color red to represent the group of reflectance values in the aerial photograph where wheat is known to exist. The VP-8 would automatically color all the portions of the image "red" where wheat is likely to exist. The same could be done with the group of reflectance values indicating the lake. The color green could be assigned. Then, everywhere a reflectance value occurred, that was associated with the group of reflectance values representing the lake, it would be colored green. All water surface areas in the image would, most likely, be shown in the color green. We might assign the color cyan to all the reflectance values associated with the plowed ground and thus indicate the probable location of all ground that has been plowed for planting.

Density slicing conventional top-lit photographs of the Shroud shows no uniform reflectance areas over the Shroud, as would be anticipated with evenly illuminated iron pigment areas of proper expanse. Using various observation methods, I could see no "dabbing patterns", as might be expected from the application of a pigment and binder. The "dabbing process", and the "iron pigment theory", are posed together as a definitive conclusion on the "trickery" side of the "explanations pile". Simple results of simple tests, such as back-lighting the image, prove such theories are incorrect. More complex tests also prove they are incorrect. Microscope examinations of the threads show no pigment, no binders, no "bleeding of chemicals" between fibers, and no fiber discoloration to match iron pigment. Spectral response tests prove there is no "signature" at the appropriate wavelengths for iron pigment reflection. And, density-slicing tests do not show large areas of even illumination indicating pigments and binders in the Shroud

image area. Yet, such "theories" are published as fact, in spite of the many test results proving it cannot be so.

People have noticed subtle patterns in the Shroud image. Some see coins. Some see flowers. One must use extreme caution in coming to conclusions based on such general spatial observations. Caution is especially warranted if the patterns observed stem solely from studying monochrome images. It is essential to determine that the "pattern" is free of "noise". If the pattern is part of the "image" on the Shroud, then stains, dirt, shadows of creases, shadows between threads, or other non-image contrast sources should not be part of the "pattern(s)". An "investigators' database", for coordinating all investigations, would help verify results and "confirm" various observations. The patterns described could very well be what they "appear to be" to those who are able to "see them". There is probably a limit to the resolution of the Shroud image, related to the cloth structure, the size of threads, and so on. A geographic information system (GIS), spatial database, could be applied to studies of the Shroud of Turin. I hope that such a database becomes available to all investigators, very soon. It could be used to aid in the study and verification of observed patterns, and contribute to all other investigations of the Shroud.

There are other unusual attributes of the Shroud image. The fingers, shown in the Shroud image, seem to extend beyond the "fleshy outline" of the fingers on our hands. In fact, the image appears to reveal the bones associated with the palm of the hand. In addition, there is darker shading in the area of the palm that would be associated with the location of our thumbs, were we to bend our thumbs onto our palms. Is this the thumb being "exposed" behind the palm, as if in an X-ray image? There are other areas of the image where it appears the shading of the image is associated with the internal body structure (i.e. bones). Does that mean the Shroud image is an X-ray? The observation does seem to prompt an explanation. Is it not sufficient to simply acknowledge the observation and not "jump to a conclusion"? I have no explanation. I do not believe the Shroud image is an X-ray, any more than I believe it is a photographic negative. I do not believe the Shroud is a gray-scale, three-dimensional image, either.

If we can avoid jumping to conclusions, we are free to describe what we observed, by using our experiences and our vocabulary. These references are made in the hope that common terms can be understood by many more people, having similar experiences and vocabulary. The Shroud image exhibits some attributes which; appear similar to the attributes of photographic negatives; appear similar to a true three-dimensional gray scale encoded image; and, appear crudely similar to the results of X-ray images.

If, however, I suggest an observation that "the Shroud image seems crudely similar to an X-ray", and one assumes from that statement that the Shroud image is an X-ray, my freedom to describe what I have seen is taken away. A false conclusion is the result. If I say, "The Shroud appears more easily comprehended, and reveals more detail, in the photographic negative form", and one assumes I mean the Shroud image is a photographic negative, they have jumped to a false conclusion. Since we do not know, and we do not comprehend, the method-of-origin of the Shroud image, it is easy to jump to conclusions. Doing so may limit our ultimate comprehension of the simple truths of our observations. A "simple truth" may be far more important than any potentially flawed assumption. We are, however, forced to work within a limited vocabulary. It was okay to simply state the Shroud was "like a photographic negative" at the time of Secundo Pia.

Today, however, we know there is much more information and detail in the Shroud than is represented by its comparison to a simple photographic negative. Today's comparisons will undoubtedly be outdated, and considered as "naïve" tomorrow.

I cannot explain, nor can I confirm, the results of the Carbon dating tests. I can only claim that the image on the Shroud of Turin required a human body that had been tortured as Christ was tortured, and murdered as Christ was murdered. I can claim that the body is not there, but the image is there. And, I respect the many other investigations which suggest the history of the Shroud is much more ancient than the carbon tests may suggest.

Conclusion

The Shroud of Turin is a unique item, with a unique image upon it. The image on the Shroud of Turin induces results in common photographic processes that are unique, relative to all other "art works" studied. Furthermore, the Shroud image induces results in an isometric "brightness model" of the image that is unique compared to all other "art works" and "objects" studied. It is very unlikely that the properties of photographic negatives were understood in the fourteenth century. It is equally as unlikely that three-dimensional modeling of gray scale information was understood in the fourteenth century.

Therefore, it is most unlikely that the Shroud of Turin is a work of fabrication, or "trickery", or "forgery", of any type. No method, no style, and no artistic skills, are known to exist, that can produce images that will induce the same photographic and photogrammetric results as the Shroud image induces. This comparison includes photographic and photogrammetric studies of bas-reliefs, paintings, sculptures, etchings, and other forms of art. The Shroud image exhibits some properties of photographic negatives, some properties of body frame (skeletal, internal) imaging, and some properties of three-dimensional gray-scale encoding.

It is "none of these", and represents portions of "all of these", and more. Much more will be uncovered in future investigations. The Shroud of Turin is, in my opinion and belief, the burial cloth of Jesus Christ. There is no way I will ever prove it. Such proof is not within my grasp. I can, however, prove what it is not.