

Image Formation on the Shroud of Turin

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Abstract

The Shroud of Turin contains good-resolution full-size images, without pigment, of the front and back of a naked crucified man. This paper proposes a multi-step process for formation of these images. By following the evidence on the Shroud where it leads, without a presupposition of naturalism, a hypothesis for image formation can be developed that is consistent with the macroscopic and microscopic evidence on the Shroud. How the image was formed on the Shroud is similar in some respects to how the image of a person is formed on photographic paper. To form the image on the Shroud requires that the mechanism that discolored the fibers to discolor only the right fibers and the right length of fibers. To accomplish this, the discoloration mechanism must be controlled by information. This information must be that which defines the appearance of a naked crucified man, because that is what the image is, and this information must be deposited on the cloth to control the discoloration mechanism. This information must come from the body, because it is only inherent to the body. It was not inherent to the air or limestone in the tomb. This information can only be transported or communicated from the body to the cloth in a focused manner by radiation such as charged particles or infrared, visible, or ultra-violet light. Thus, the proposed hypothesis for image formation involves radiation emitted from the body that carries the information to the cloth that is required to control the discoloration mechanism. We can see the image because this information has been encoded into the pattern of discolored fibers that make the image. The radiation is believed to primarily be charged particles that caused a static discharge from the top portions of the fibers facing the body. This static discharge would cause heating due to electron flow, and possibly ozone production, that could discolor fibers consistent with the microscopic properties of the discoloration on the fibers in the image. This process also naturally results in a negative image that contains 3D or topographical information, and threads with a mottled appearance.

1. Methodology of Research

To solve how the image of a naked crucified man was formed on the Shroud, researchers must carefully follow the physical evidence where it leads, which is forensic science. This should be an objective search for the truth without being constrained by presuppositions such as religious beliefs or a philosophical assumption of naturalism. As defined in section 3 of Ref. 1, naturalism as used in this document is the assumption that the only explanations permitted are those consistent with our current understanding of physics. It is thus based on the assumption that our current understanding of physics is so perfect and complete that nothing new about physics can ever be discovered again. To reject naturalism does not assume anything about God, either his

existence or his involvement in this world, it only assumes reality may not be perfectly and completely defined by our current understanding of physics. It is important for the Shroud researcher to approach his research with a neutral mindset because the goal should be to determine the truth, not to promote personal presuppositions. To have a neutral mindset means the researcher, when he starts his research, should believe the Shroud may or may not be the burial cloth of Jesus, and the image may or may not be the result of a unique event. If it is a unique event, then it may or may not be related to the disappearance of the body from within the Shroud, etc. None of this assumes God's existence or that he has done anything in history, it only assumes there may be more to reality than our current understanding of physics has discovered. It would be contrary to the scientific method for the researcher to assume naturalism. This is because it would bias the mind against a whole set of possible explanations, i.e. those that are outside or beyond our current understanding of the laws of physics. Rejection of the philosophical assumption of naturalism is necessary to allow the researcher to follow the evidence where it leads with a neutral mindset, rather than to be restricted in his thinking by his presuppositions (section 3 of Ref. 1).

2. Hypothesis

Based on the results of eight decades of research (1898 to 1978), most Shroud researchers today believe the evidence indicates the image was not formed by an artist or forger, but that the body wrapped in the cloth encoded an image of itself onto the cloth. This is based on the evidence and reasoning in section 2 of Ref. 2, section 3 of Ref. 3, and sections 6.3 and 6.4 of Ref. 4. Thus, the starting point for this proposal is that the image was formed by the body that was wrapped within the Shroud.

To be consistent with the evidence, it is proposed that the image was formed by a multistep process. This proposal starts with radiation being emitted from the body to carry the required information (the information that defines the appearance of a naked crucified man) from the body to the cloth (Ref. 5). This information was not in the limestone or air in the tomb. It was only inherent to the body. This information was required to control the mechanism that discolored the fibers so only the right fibers, and the right lengths, would be discolored so that a good-resolution image of the crucified man could be formed on the fabric. This information was carried, transported, or communicated from the body to the cloth, and deposited there, by the energy, intensity, and direction of the radiation (Ref. 6). Thus, we can see the image of a crucified man on the Shroud because the information that defines the appearance of a crucified man has been encoded into the pattern of discolored fibers on the Shroud. Reflected light carries this information from the Shroud to our eyes so that our brains can recognize the image of the crucified man, just like reflected light carries the information from a photograph to our eyes so that our brains can recognize the image in the photograph.

The radiation not only had to be emitted from the surface of the body, but it likely also had to be emitted from within the body. This is because the appearance of bones can be seen in the image. Even casual observers report seeing the appearance of teeth on the image. The best explanation of this appears to be that the teeth were encoded into the image. It seems unlikely that the recognition of teeth on the face is only a result of the pattern of the fibers. If it were, this same

pattern of teeth would be seen across the entire front and back images. With a bit of study, it is usually recognized that the lines that show at the hand are the bones in the palm of the hand rather than the fingers. The appearance of vertebrae in the backbone and the separations between bones in the skull have also been reported. If teeth or other bones have been encoded into the image, then the radiation had to be emitted within the body to carry the information regarding these bones from the body to the cloth. If, in spite of what we apparently see, there are no bones encoded into the image, then the radiation is not required to have come from within the body, though it may have.

Since there was no lens between the body and the cloth to focus this radiation, the radiation had to be emitted in vertically collimated directions up and down, like a billion vertically oriented lasers going off simultaneously within the body. Only in this way could each point on the cloth be affected by only one point on the body (the point directly above or below it) so that good resolution front and back images could be formed without a lens. The main type of radiation that caused the image is believed to be charged particles (Ref. 7). Protons and electrons are examples of charged particles, but there are many other types of charged particles in the standard model of particle physics. Low energy electromagnetic radiation (Ref. 8 and 9) such as infrared, visible light, and ultraviolet could also have contributed to forming the image. Highly penetrating radiation such as neutrons, X-rays, and gamma rays are not believed to be primarily responsible for the image because if they were, then the image would have been just as strong on the outside of the Shroud as it wrapped the body as on the inside of the Shroud that was facing the body, which is contrary to the evidence. To be consistent with the evidence, the radiation had to be emitted in an extremely short intense burst, as in Ref. 9, to explain why it only affected the top one or two layers of fibers on the threads. This extremely short intense burst of charged particle radiation would produce a strong charge on the fibers, which would cause a static discharge from the highest fibers facing the body, consistent with the location of the discolored fibers on the cloth. This static discharge from the top sections of fibers facing the body would include high current flow from the surrounding fabric to the fibers undergoing the static discharge, which would produce significant heating of the fiber and possible production of ozone. Both the electrical heating and possible ozone could discolor the fibers facing the body. Some of the fibers on the outside of the wrapped configuration might also have been discolored by the same mechanism, though probably not to the same degree of discoloration, due to the electrical flow in the fibers as they twist around the threads.

3. Effects on the Shroud

Two of the very unusual characteristics of the image are: 1) the image is similar to a negative with dark and light areas generally reversed, and 2) the image contains 3D or topographical information related to the vertical distance of each point on the cloth from the body. These aspects of the image naturally result from the above concept of image formation. As the radiation travels vertically across the air gap between the body and the cloth, it will naturally undergo absorption and scattering in the air, and possibly also decay. These three processes can diminish the intensity of the radiation as it travels across the air gap, so the effect of the radiation on the cloth will be strongest where the distance between the body and the cloth is a minimum, such as the tip of the nose where the cloth would have been in contact with the nose. At

distances to either side of the tip of the nose, where the vertical distance from the body to the cloth increases, the intensity of the radiation will naturally diminish as it travels across a greater vertical distance before it reaches the cloth. Thus, the extent of the fiber discoloration will be a function of the vertical distance between the body and the cloth, with no fiber discoloration if the vertical gap is over about 3 or 4 cm. In a photograph of a person, the tip of the nose is bright because it is in an exposed position on the face where it readily reflects light, but in the Shroud image, the nose is dark because the radiation reaching that location has not been diminished by absorption, scattering, or decay. This light/dark reversal causes the apparent negative image. And the intensity of the radiation diminishing as a function of the gap distance causes the 3D or topographical information to be present in the pattern of discolored fibers in the image. This is what allows a 3D statue to be generated from the image on the Shroud (Ref. 10). This type of 3D information in the image is not present in photographs, paintings, or other artistic productions so the image on the Shroud cannot be a photograph, painting, or other artistic production.

In the image, the discoloration on the threads shows a mottled appearance. This mottled appearance is due to the discolored fibers being grouped together on a thread with large portions of each thread having few if any discolored fibers. The image encoding process discussed above automatically produces this mottled appearance of the threads. This is because the discolored fibers are grouped together where the electrical discharge took place, with no discoloration where the electrical discharge did not take place. This can be called a “lightning rod” effect because it is similar to lightning hitting the tip of one lightning rod, but no other lightning rods in the area. This lightning rod effect can be explained as follows.

Assume a fairly level plain but with some points higher than others, with many lightning rods distributed over it, so that some lightning rods can be somewhat higher than others. As a thundercloud passes over the ground, an electrical charge builds up between the ground and the cloud due to friction. In general, the largest charge difference will be where there is a minimum distance between the tip of a lightning rod and a low point in the thunder cloud. When this charge difference becomes large enough to ionize some of the atoms in the air by stripping off an outer electron from the atoms, it very quickly forms a cascade of ionized atoms resulting in a lightning strike to the tip of one of the lightning rods, probably the one that minimizes the distance between the lightning rod and the cloud. But when this first lightning strike occurs, an electrical current in the earth flows toward the one lightning rod thus tending to discharge the other lightning rods that are close to it. An electrical current also flows in the clouds toward the location where the lightning originated in the clouds thus tending to discharge the nearby locations in the clouds. This explains why lightning will tend to strike only one lightning rod in a broad area.

This lightning rod effect explains the formation of the mottled appearance of the threads in the image. The discolored fibers are the highest points facing the body on the threads, with the discolored fibers grouped together and other areas of the threads having few if any discolored fibers. Of course, on the Shroud, the charge difference that caused the static discharge from the top portions of the fibers was not formed by thunder clouds rubbing against the fabric, but by the extremely brief powerful burst of radiation that was emitted from the body and was deposited on the cloth. This radiation, which is believed to be primarily charged particles, deposited its electrical charge on the cloth that caused the static discharge from the fibers.

4. Conclusion

In summary, it is proposed that the image was formed by an extremely rapid powerful burst of charged particle radiation from the body that caused a static discharge from the top fibers on the cloth facing the body. The resulting extremely high electron flow could have discolored the fibers by heating. Due to electromagnetic effects, an extremely high electrical current in a conductor will flow primarily in the outer perimeter of the conductor, so that heat from the electron flow would be deposited primarily in the outer perimeter of the conductor. Similarly, an extremely high electron flow in the fibers would deposit the resulting heat primarily in the outer perimeter of the fiber, just where the fibers are discolored in the image. If ozone were also produced in the air by the static discharge, it could also chemically attack the outer perimeter of the fibers. Both effects could explain the microscopic characteristics of the image: 1) only the top one or two layers of fibers discolored in a thread, 2) a discoloration thickness on the fibers of only about 0.2 microns out of the 10 to 20 micron thickness of the fibers, and 3) discoloration of the fibers caused by single electron bonds being changed to double electron bonds on the carbon atoms that were already in the cellulose molecules in the fibers that make the image.

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Biography

Robert A. Rucker earned an MS degree in nuclear engineering from the University of Michigan in 1971. He worked in the nuclear industry for 38 years in nuclear reactor design, nuclear criticality safety, and statistical analysis of measurements for nuclear material inventories. He holds Professional Engineering (PE) certificates in nuclear engineering and in mechanical engineering. He has been doing independent research on the Shroud since 2014. He organized the International Conference on the Shroud of Turin (ICST-2017) held July 19-22, 2017, in Pasco, Washington. His papers on the Shroud can be downloaded from the research page of his website at <http://www.shroudresearch.net/research.html>. Send comments, questions, or corrections to robertarucker@yahoo.com.

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