

SHROUD IMAGE FORMATION. Some notes on the mechanism proposed by Rogers and Arnoldi by Denis Mannix

The body image is the central mystery of the Shroud. ie. what is it made of, how was it formed and how does it include the strange detail of a negative image that also has three dimensional properties. In addition to all this is the question of how is it that that the image, which has been durable for so many centuries can be so easily removed eg with selotape.

A paper published *in 2003 together with some private communications with one of the authors appears to provide an explanation.

There have been many theories for the formation of the image. Some are based on the belief that the Shroud is a forgery. These theories include applying to the cloth something that would form an image, ie pigments or paint; rubbing and scorching the cloth, eg. on a heated statue; camera obscura technology and others. . Shroud believers on the other hand have suggested non-human interventions, including an unspecified chemical reaction between the cloth and vapours arising from the body; the emission of a searing flash of energy at the moment of the resurrection, and the image being formed as the cloth collapsed through the space previously occupied by the body which had instantaneously de-materialised. None of these proposed mechanisms explain the full range of the image properties.

An early suggestion for the formation of the image was that vapours from the brutalised corpse reacting with myrrh and aloe on the cloth had formed the image. It was known that compounds, with a particular chemical structure known as “amines”, were emitted from corpses and from decomposing flesh. However there was no known chemistry by which amines could react with linen fibres to give a coloured compound, with or without the presence of the burial spices. This appeared to rule out this explanation and scientists, and sensationalists, have continued to look elsewhere for a possible image formation mechanism. However, with this body-vapour theory, we may have been closer to the truth than was realized.

Historic research has recently provided some new, very relevant information about ancient linens. Pliny the Elder, the inveterate Roman natural historian, describes in some detail the production of linen cloth during his times. He reports that, to prevent the threads being broken during the weaving process, the warp threads were soaked in starch to leave a starch lubricant on the surface. This eased the weaving process but produced linen that was harsh due to the starch on the threads. The starch was removed by soaking the linen sheets in an extract of the plant, soapwort, This plant contains a natural detergent and using it washes out the bulk of the starch. After the washing with soapwort the linen sheets are left to dry in the air by evaporation of the water. This leaves a linen that is supple and acceptable.

Rogers and Arnoldi investigated this process further. They discovered that the evaporation of the soapwort solution leaves a deposit of mixed starch and detergent on the outside of the linen threads that is invisible to the naked eye. This deposit is not chemically linked to the cloth; it is loosely adhering to it, rather like the chalk on a blackboard. The deposit slowly changes to produce chemicals known as “reducing sugars” that are very reactive. The authors state that it this deposit of reducing sugars, and not the linen itself, that reacts with amines from the body and forms the new materials which constitute the image colour. This is a golden brown substance and it is formed in a well known chemical reaction called a Maillard reaction.



The image forms as the amines vapours reach the deposit on the cloth and react with it. The closer the cloth is to the body at any point the greater the concentration of amines and the more intense the resultant image. The highest concentrations occurs where the cloth and the body are actually in contact eg at the point of the nose. Thus, the high points, eg the nose, will produce the most intense image while the points farthest away from cloth, eg the hollows of the eyes, will create a less intense image. It is this variation in image intensity

that indicates the distance of the different parts of the body from the recording device ie cloth. (Observant people had already noticed the depth effect but had not been able to measure it until NASA entered the studies. The NASA Image Analyser was designed to analyse high altitude planetary photos and was the first instrument to quantify the image densities on the Shroud and to print out the 3 D profile for the body.)

The image is darker than the cloth and this causes it to be a negative in the photographic sense with the high points generating the darker parts of the image. Furthermore, since the image is not formed on the linen itself but upon the deposit it can be removed, together with any unreacted deposit, with selotape ie like the chalk from a blackboard. The medullae, the hollow tube within the thread remain colourless further illustrating that the image is entirely on the surface.

One of the surprises from this possible explanation of the image arises from the very fine detail that is achieved eg. the separation of the individual fingers. This accuracy of registration might not have been expected from a process that involves the diffusion of vapour. In a private discussion, Ray Rogers said that he had carried out experiments using a “dummy” hand coated with amines (these were not specified) and cloths with reducing sugars to simulate the Shroud. He said that he also had been surprised at the level of fine detail that was achieved in the images. It is known that the temperature of corpses can rise above normal body temperature. Rogers was of the opinion that the diffusion of the amines in all directions away from body, that would occur naturally, was very slow compared with the much more intense thermal movement arising from the heat in within the body.

This thermal current carried the amines vertically to the deposit on the cloth where they formed the image directly above the feature on the body from which they had originated. The open weave of the linen would allow the vapours to pass through and thus avoid them concentrating and spreading sideways along the lower surface of the cloth and obscuring the detail. These unreacted amine vapour after passing through the weave would react with the deposit on the other face of the cloth and would form a second image. If the amines were sufficiently concentrated this image would become visible. Some researchers have reported seeing such a second image.

Eventually, the thermal effect would have weakened as the body cooled and the diffusion effect would become the major cause of movement of the amines between the body and the cloth. In time this would have caused a random darkening of the whole cloth and the loss of the image. The linen had obviously been separated from the body before this stage was reached.

Although this particular aspect was not discussed with him, Rogers’ explanation of the thermal transport of the amines to the cloth would not apply for the dorsal image where the amines are being formed above the cloth. In this case the main image is formed by direct contact between body and cloth. The image of any body parts which are not in direct contact can only be formed by multidirectional diffusion of the amines and they will be less distinct than on the facial side. This effect may be seen in the lack of detail for the left lower leg and for the right small of the back.

This explanation of the image formation indicates that any corpse covered, while it was still warm, with a linen shroud that had had been treated with soapwort would produce a similar shroud image in the initial period after burial. However, after a sufficient passage of time, the image would be obliterated by the mass of amines arising from all parts of the body. In the case of the Shroud we have a naked, badly damaged and traumatised body being wrapped in high-quality linen which must have then been separated from it in the early stages of the image formation ie. before the stage of image obliteration.

In this work Rogers and Arnoldi have been able to show that the image could have been formed through a sequence of well known scientific steps and without any mystery or unproven scientific theory. Their hypothesis provides an explanation for every aspect of the image that has been noted.