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THE BODY IMAGE ON THE SHROUD WAS NOT PRODUCED BY PROTONS

Giovanni Fazio

Dipartimento di Scienze Matematiche e Informatiche, Scienze Fisiche e Scienze della Terra, Università di Messina, I-98166 Messina, Italy
(gfazio@unime.it)

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ABSTRACT

In this article, we want to demonstrate that the attempts to yield a Shroud Body Image, utilizing protons, are futile. For two-three decades, several articles on the subject have not been enriching enough. It is maintained that in the body-sheet contact areas, the protons, with the appropriate energy E*, penetrate to a depth equal to that of the Shroud Body Image (200 nm). In areas away from body it is necessary to take into account the protons energy dissipation in the air. Hence, through the thickness of the air, the protons cannot have enough energy to penetrate the linen up to 200 nm. These particles could not reach the linen areas either furthest from the body, as it is in this case. We argue that the protons energy is not enough to reach the furthest areas of the sheet which will remain unstained. Therefore, no image and, consequently, nor the so-called 'Proton Model' can explain the Shroud Body Image formation.

KEYWORDS: Shroud, Body Image, Protons, Range-Energy, optical, fibrils, radiation

1. INTRODUCTION

For various decades, the study of the radiation-matter interaction has interested many scholars of the Shroud of Turin. This continues to happen because they believe that the formation of the image (that appears on the above Linen) could be explained by the action of protons or protons-like particles. Consequently, after that of Rinaudo (1994), many proposals appear in literature and on the web to explain the Shroud body image formation considering some types of radiation (Rinaudo, 1994, 1995, 1998; Antonacci, 2000, 2012; Rucher *et al.,* 2016; Rucher, 2016). We will demonstrate that this choice is unfortunate because it is unable to reproduce the characteristics of the Body Image on the Linen of Turin (Fig. 1).

In our stand this phenomenon or image is due to the natural process as already described in (Fazio *et al.,* 2019) but not yet experimentally verified. In synthesis, the small quantity of thermal energy emitted by the corpse wrapped in the Shroud of Turin (the only source of energy present in an ancient sepulcher) is the right one to trigger a stochastic process. This mechanism, as a result, should produce a latent image. The time of latency of the above process varies from years to decades (Fazio *et al.,* 2019; Fazio and Mandaglio, 2011, 2012).

The proposals, made by researchers of the Shroud (Antonacci, 2000, 2012; Rinaudo, 1994, 1995, 1998; Rucher et *al.,* 2016; Rucher, 2016) and accepted by many scholars, are certainly extravagant, especially when they hypothesize that the particles, emitted from within the body, must have been vertically collimated both up and down. This would occur for having a good resolution, assuming the body was lying horizontally in the sepulcher. However, in front of these ideas, it should be necessary to separate the transcendental events (the corpse, wrapped in his burial linen, that emits particles) from the rational ones.

Therefore, for the above scholars, the formation of the Shroud body image is possible if the protons were emitted in a vertical direction, vertically up and vertically down. Also, a random emission from every point of the body in all directions should produce no image.

It is known that the protons produce coloration when penetrating the linen. They, generate ion-electron pairs or excite the electrons of the matter crossed in detail. These particles can also be diffused by atoms of matter or produce nuclear reactions, but the ionization and excitation effects are the predominant ones. The loss of electrons oxidizes the linen and at a macroscopic level it becomes yellow. The linen changes its color as it ages due to the action of electromagnetic radiation. The penetration depends on the type of particles, their energy and the characteristics of the matter crossed.

So, it is clear that the protons ionize a linen cloth, oxidize it and, therefore, makes it yellow. However, it is difficult to obtain an image like the one present on the Linen of Turin with all the measured characteristics that, in an attempt to explain it, should be reproduced. Furthermore, for the above Shroud researchers, the neutrons in the fabric could increase the presence of radiocarbon. Thus, in a possible measure of the age of the sheet, it could appear rejuvenated.

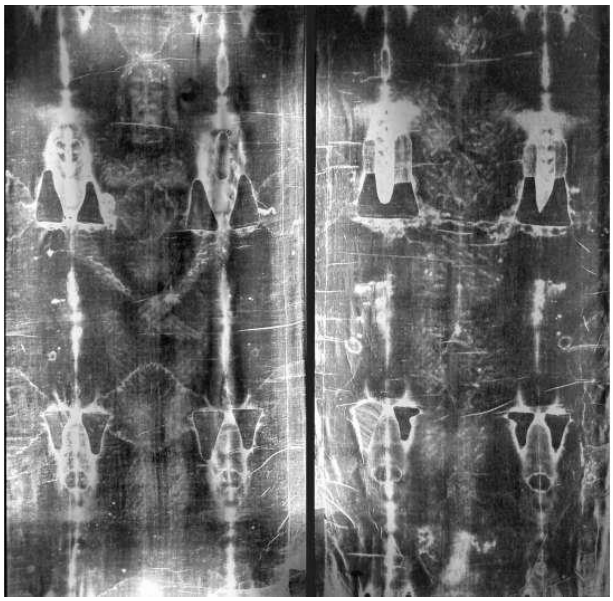

Figure 1. Negative photography of the Shroud of Turin. Left: full frontal image, Right: full dorsal image

In our opinion, the choices of the above scholars (Antonacci, 2000, 2010; Rinaudo, 1995, 1998; Rucher et *al.,* 2016; Rucher, 2016) are not correct. Also, a scientific study cannot begin with a "Miracle". However, their objective to answer two important Shroud questions are still open: the age of the Shroud and the body image formation.

The above particles could modify the surface of the fabric in the region where the body image lies. So, we could have a comparison with the Linen of Turin. However, the use of protons must answer an important problem: will they be able to distinguish, among all the fibrils of the burial linen, those that need to be yellowed possibly with the same optical density?

Thus, under current stand, we have decided to investigate the capability of protons to penetrate the matter of our concern (linen and air).

2. ANALYSIS AND DISCUSSION

For our investigation it is necessary to remember the characteristic of the Linen of Turin (Gilbert and Gilbert,1980; Heller and Adler, 1981; Pellicori and Evans 1981; Schwalbe and Rogers, 1982; Jumper *et al.*, 1984) underlining the following:

"On the Turin Shroud, between the image Intensity I (or yellowed fibrils density) and the body-sheet distance R an I(R) correlation exists, represented by linear regression: $I(R) = I_M + (1 - R/R_0)$. In this expression I(R) represents the image intensity value at body-sheet distance R, I_M represents the maximum value of Image Intensity, reached only in the contact areas, and R_0 the R body-sheet distance that makes $I(R_0) = 0$. The R ranges between zero and R_0 = 37mm. The above distance value was deduced by a fitting procedure using 13 values of Image Intensity measured, with a microdensitometer by Vernon Miller (Brooks Institute, CA), in very specific locations (Jackson et al., 1982, 1984). This function has been extracted from the data reported in the (I,R)-plane, that are scattered. In fact, the degree of correlation was r^2= 0.60. However linear regression is the best fit possible. Denying this is like denying that the image contains encoded information on the body-sheet distance. Here, we must emphasize that this trend comes from afar (Vignon, 1902, 1902a). However, for more detailed information, the reader is directed to see page 179 of the article (Fazio and Mandaglio, 2021)."

Now, we can investigate the protons when they penetrate the air to observe their trend and to compare it with the linear regression I(R) of the Shroud. To reach our purposes, it is sufficient to use an empirical expression range-energy in the air for protons. These particles would be emitted from the corpse to go towards the linen that wrapped it. With this in mind, we will use the Formula of Wilson and Brobeck:

$$R(E_P)=(E_p/9.3)^{1.8} \qquad (1)$$

where R is the range in meters and E_p is the proton energy in MeV. We can also write $E_p(R) = 9.3 \cdot R^{5/9}$ that is the protons energy E_p versus R. The protons must be able to cover up the body-sheet R_0 distance (37 mm) penetrating the air and, successively, it must have sufficient residual energy to penetrate the linen.

In detail, we consider two points: the first one in areas of body-sheet contact, the second one (always on the corpse surface) in areas without the above contact, at a distant R from the burial linen. In the contact point, all the energy of the protons is absorbed up a certain depth of the linen. Today, we know this value that is about 200 nm (Fanti *et al.*, 2010). In the second point, the emitted protons should have an energy sufficient to travel the R distance in the air plus the necessary one to penetrate the linen for the above same depth. The expression that describes the energy that the protons can furnish to the burial linen is:

$$E_{linen} = E^* - 9.3 \cdot R^{5/9} \qquad (2)$$

where E* is the energy of the emitted protons. This energy must be the same for all the particles. In fact, observing the Shroud contact areas, where the energy of the protons is totally absorbed by the linen, the thickness is the same.

Consequently, the Intensity of the coloration $I_P(R)$ which is proportional to E_{linen}, does not turn out to be a linear function. Differently from the I(R) function obtained for the Shroud of Turin that is a linear regression. However, this should not be a problem for the supporter of the coloration produced by protons. In fact, in small spaces such as those between the corpse and the sheet, the difference between the two functions, taking also into account that for the Shroud the data in the (I,R)-plane are scattered, does not allow to discard definitively the hypothesis of the protons. Anyway, there is always the possibility to realize how it is described in the (Rinaudo, 1994, 1995, 1998; Antonacci, 2000, 2012; Rucher et *al.*, 2016; Rucher, 2016) but only if all the protons had different energies and the ability to take into account, case by case, the body-sheet R distance value. We know this is impossible.

Also, using other range-energy expressions, present in scientific literature, the obtained results would not be changed. Furthermore, a similar one was obtained by us with the Formula of Rogozinski:

$$R(E_P) = a^{-1.8} \cdot (E_P)^{1.8} \qquad (3)$$

where a=29 for air, E_p in MeV and R is obtained in g/cm^2. In this case, the rate between the obtained R(g/cm^2) value and the density ρ(g/cm^3) of the matter crossed furnishes the depth of the penetration.

In our case a simple crude calculation, using the Bragg-Kleeman rule ($R_1/R_2 = \rho_2/\rho_1 \times (A_1/A_2)^{0.5}$ valid for the same particle in different '1' and '2' materials) and taking into account that we are in the presence of compounds. So, it is necessary to calculate the values of the effective Atomic Weight: $A^{0.5} = \sum n_i A_i/n_i (A_i)^{0.5}$ where n_i is the atomic fraction of the element whose atomic weight is A_i (Evans, 1955; Meyerhof, 1967). So, we demonstrated that the same protons that penetrated the primary cell wall of the fibrils for 0.2 μm, they crossing the air will do it for a thickness of the order of a few hundred μm. With this state of affairs, there will be no image because the areas beyond this thickness will not be reached by the particles. So, we can affirm the total failure of the protons as tool to produce the Shroud Body Image.

When looking at the above result, it is easy to understand why we have only made a simple and crude calculation. It was sufficient to demonstrate our rejection of the use of protons to produce the image appearing on the Shroud of Turin. Therefore, we can

discard the protons hypothesis of Rinaudo (1994, 1995, 1998).

Unfortunately, for the above model there are other problems. Interestingly, it is very difficult for anyone to accept the hypothesis that the corpse of a man can emit protons (Rogers and Arnoldi, 2002, 2003; Rogers 2004, 2005, 2008; Schwortz, 2021). No one has ever seen an event of this nature in all the history of humanity. Despite this, some authoritative scientists still believe in the above hypothesis.

Furthermore, the protons and the proton-like particles (as the deuteron, tritium, ^{3}He, and α-particles) are not able to distinguish the fibrils that must be yellowed (with the same optical density value) to yield the Shroud body image, from the ones that must maintain the background color. Both fibrils, those already yellowed and the others with the background color that lie in the region of the image, are mixed, but not randomly: the density (or the Image intensity) of the yellowed ones is a linear function versus the body-sheet distance. Finally, the effects of the neutrons have not been explored since the protons analysis had already demonstrated how preposterous were the hypotheses presented in the introduction.

3. CONCLUSION

We have rarely seen a dismissal of the laws of natural sciences. We attribute these ideas to the ever-present religious conflict in the study of the Shroud of Turin. The result is conditioning for many, on both sides, and does not help the search for truth (Fazio, 2016).

The analysis of the protons trend, penetrating both the matters (air and linen), has displayed that the particles cannot obtain the result present on the Shroud Body Image. In this case the protons, emitted by the corpse with energy E* penetrate the linen for a depth of 0.2 μm and, at the same time, do not reach most of the sheet in non-contact areas. On the contrary, the above-colored thickness on the Shroud Body image is present on all the surfaces.

We believe that the protons are not adequate to explain the Shroud of Turin Body Image formation. Moreover, the hypotheses made are not with rational basis, but the transcendental one. Therefore, the initial hypotheses concerning the laws of the natural sciences can't be accepted.

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